AD-A144 073 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS SEYMOUR RESERVOIR DAM..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV FEB 80 1/2

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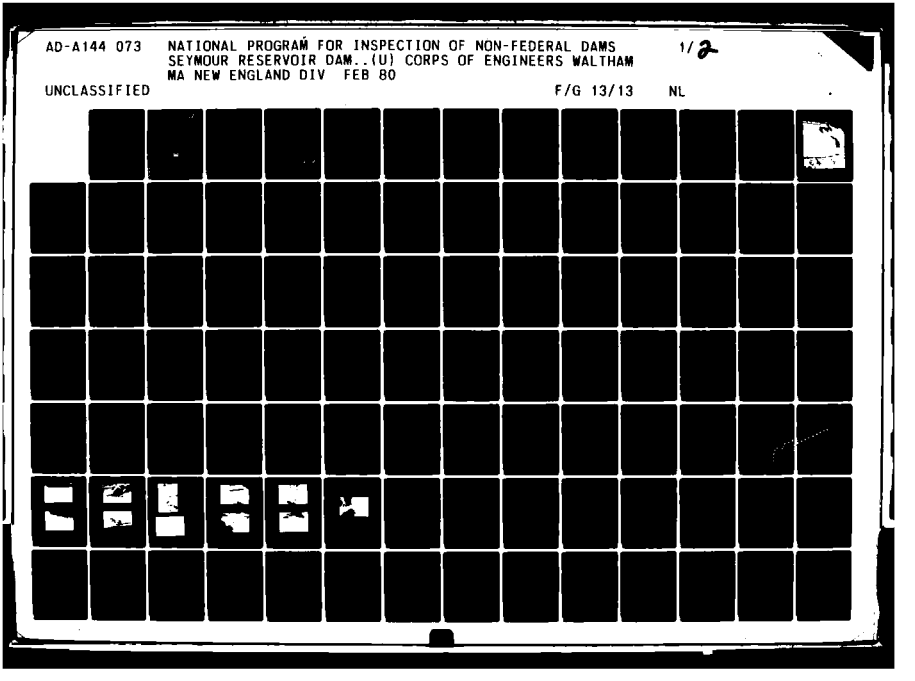

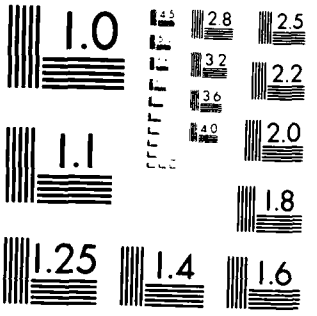

NAUGATUCK RIVER BASIN
OXFORD, CONNECTICUT

SEYMOUR RESERVOIR NO. 2 DAM
CT 00324

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

FEBRUARY 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00324	2. GOVT ACCESSION NO. AD-A094017	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Seymour Reservoir No.2 Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE February 1980 13. NUMBER OF PAGES 55
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Naugatuck River Basin
Oxford, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Seymour Reservoir No.2 Dam consists of an earth embankment with a masonry core wall. The dam is approximately 900 feet long with a top width of 10 feet and a maximum height of 31 feet. Based on the visual inspection and a review of all available pertinent data, the condition of the dam is judged to be fair. The dam is classified as "Small" in size, with a "High" hazard potential. A test flood equal to ½ the PMF was selected.

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SEYMOUR RESERVOIR DAM NO. 2
CT 00324

NAUGATUCK RIVER BASIN
OXFORD, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

I

049-08

FEBRUARY 1980

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

IDENTIFICATION NO: CT 00324

NAME OF DAM: Seymour Reservoir No. 2 Dam

TOWN: Oxford

COUNTY AND STATE: New Haven County, Connecticut

STREAM: Tributary to Hemp Swamp Brook

DATE OF INSPECTION: November 28, 1979

BRIEF ASSESSMENT

The Seymour Reservoir No. 2 Dam consists of an earth embankment with a masonry core wall. The dam is approximately 900 feet long with a top width of 10 feet and a maximum height of 31 feet. A 25.75 foot long concrete overflow spillway is located near the right end of the dam. The outlet works consist of a 12-inch cast iron low level outlet or blowoff pipe through the embankment, controlled by a downstream gate valve. In addition to the main dam, a low dike is located on the right side of the reservoir. The earth dike is approximately 800 feet long with an average height of 6 feet and a top width of 15 feet.

The dam impounds Seymour No. 2 Reservoir, a storage reservoir for public water supply for the Valley Division of the Bridgeport Hydraulic Company.

Based on the visual inspection and a review of all available pertinent data, the condition of the dam is judged to be fair. The future integrity of the dam can be affected by deterioration of the floor of the spillway channel; seepage exiting downstream of the dam;

the absence of an upstream gate on the low level outlet or blowoff line; and inadequate spillway capacity.

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the dam is classified as "Small" in size, with a "High" hazard potential. A Test Flood equal to one-half the Probable Maximum Flood (1/2 PMF) was selected in accordance with the Corps of Engineers' Guidelines. The calculated Test Flood inflow is 580 cfs and the routed outflow is 550 cfs.

The spillway has a capacity of 500 cfs without any flashboards and 100 cfs with flashboards before overtopping the low point of the dam crest. With flashboards the spillway can pass 18 percent of the routed Test Flood outflow. Without any flashboards the spillway can pass 91 percent of the routed Test Flood outflow and the outflow would overtop the low point of the dam crest by 0.2 feet.

It is recommended that the owner engage the services of a qualified, registered engineer experienced in the design of dams to design repairs to the floor of the spillway discharge channel; to investigate the significance of the seepage observed downstream of the dam; to design modifications to the blowoff to provide for a gate at the intake; and to perform a detailed hydrologic and hydraulic analysis to determine the need for and means to provide additional project discharge capacity. In addition, the flashboards should be removed immediately from the crest of the main spillway to elevation 365.4; technical inspections by qualified, registered engineers should be made every year; a formal operations and maintenance manual should be prepared; and a formal warning system should be put into effect.

The owner should implement the recommendations as described herein and in greater detail in Section 7 within one year after receipt of this Phase I Inspection Report, with the exception of flashboard removal, which should be done immediately.

ROALD HAESTAD, INC.

Donald L. Smith, P.E.
Project Engineer

Roald Haestad
President

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the

condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety of the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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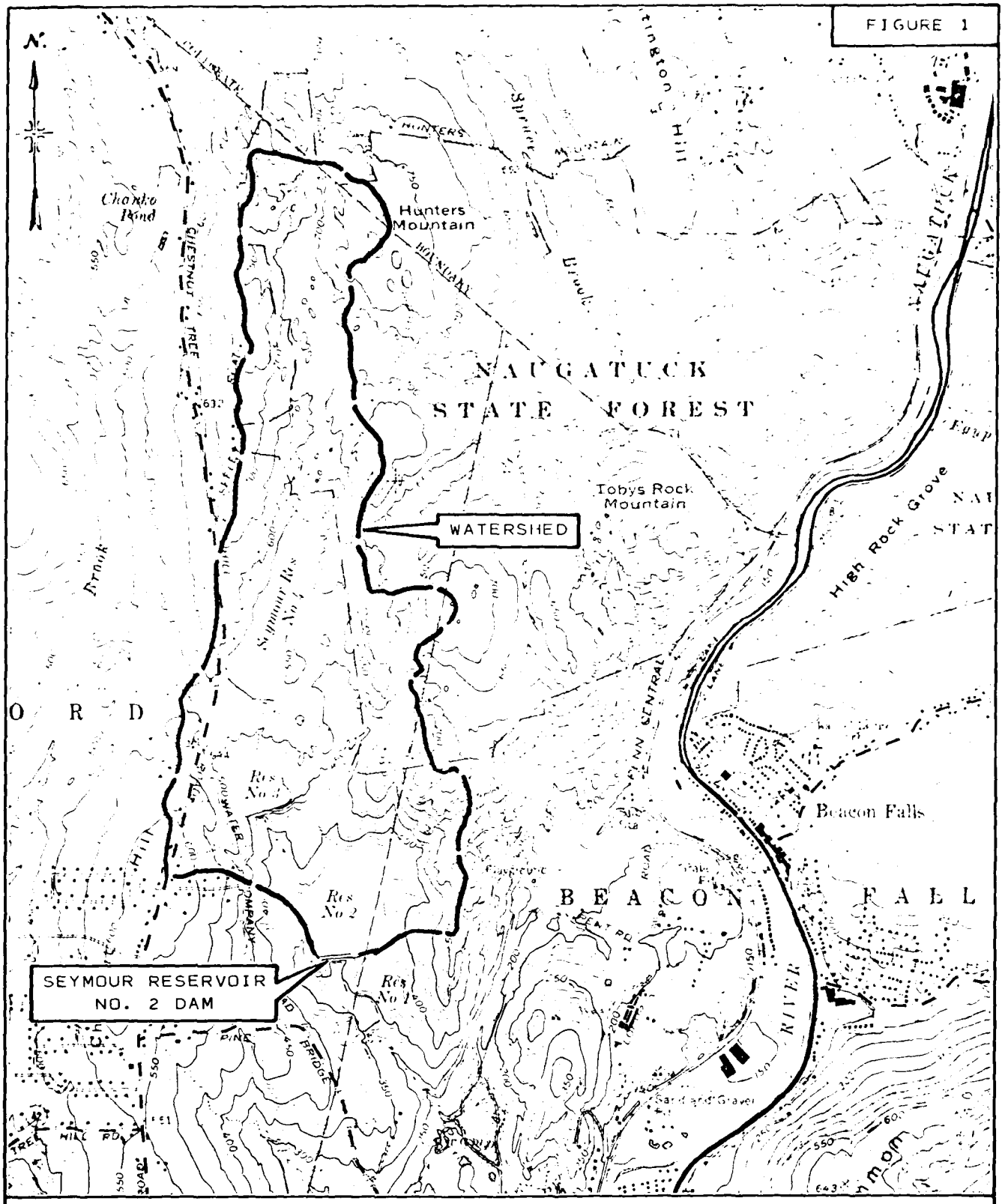
U.S. ARMY ENGINEER DIVISION, NORTH ATLANTIC ARMY CORPS OF ENGINEERS NEW YORK, NEW YORK	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
HARZA ENGINEERING COMPANY CHICAGO, ILLINOIS	

FIGURE 1



LOCATION PLAN

SEYMOUR RESERVOIR NO. 2 DAM
OXFORD, CONNECTICUT

SCALE: 1" = 2000'

ROALD HAESTAD, INC.

NAUGATUCK QUADRANGLE 1972

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

PROJECT INFORMATION
SECTION 1

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Roald Haestad, Inc., has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Roald Haestad, Inc. under a letter of November 1, 1979, from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0015 has been assigned by the Corps of Engineers for this work.

b. Purpose

The Purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to indentify conditions requiring correction in a timely manner by non-federal interest.
2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.
3. To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

The dam is located on an unnamed tributary to Hemp Swamp Brook in the Town of Oxford, Connecticut, near the Oxford-Beacon Falls Town Line. The dam is shown on the Naugatuck Quadrangle Map having coordinates of latitude N 41° 26.3' and longitude W 73° 05.2'.

b. Description of Dam and Appurtenant Structures

The Seymour Reservoir No. 2 Dam consists of an earth embankment with a masonry core wall. The dam is approximately 900 feet long, with a top width of 10 feet, a maximum height of 31 feet, and upstream and downstream slopes of 1.5 horizontal to 1 vertical. The upstream slope is protected with a layer of riprap and the downstream slope is grass covered. The present dam was constructed between 1947 and 1948 immediately downstream and against an existing earth dam. The original earth dam had a maximum height of 25 feet, a top width of 12 feet, and upstream and downstream slopes of 1.5 horizontal to 1 vertical. The core wall for the original dam extended from approximately 8 feet below the original ground surface to within 2 feet of the top of the dam. The original core wall is 2 feet wide for the top 6 feet, and then increases approximately 2 feet in width for every 15 feet in depth. The core wall was increased approximately 5 feet in height when the dam was raised in 1947-48. The extension of the core wall is located approximately 6 feet downstream of the original core wall and connected to it by a 12-inch thick concrete slab as shown on the drawings in Appendix B.

In addition, the original core wall was lengthened at each end. The new core wall extends from 1.5 feet below the top of the dam to approximately 5 feet below the original ground surface. A 25.75-foot long concrete overflow spillway is located near the right end of the dam. There is a 5 foot long by 2.5 foot deep slot in the center of the spillway that contained flashboards. There is an additional 2 feet of flashboards on the entire spillway. The outlet works located approximately 250 feet from the right end of the dam consist of a 12-inch cast iron low level outlet or blowoff pipe through the dam controlled by a downstream valve discharging to Seymour Reservoir No, 1 through a fountain aerator. Bypass piping and valves allow for discharge downstream of Reservoir No. 1 Dam.

In addition to the main dam, a low dike is located on the right side of the reservoir. The earth dike is approximately 800 feet long, with an average height of 6 feet, a top width of 15 feet, and upstream and downstream slopes of 2 horizontal to 1 vertical. Drawings indicate that a core wall was also constructed at the dike.

c. Size Classification - "Small"

According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, a dam is classified as "Small" in size if the height is between 25 feet and 40 feet, or the dam impounds between 50 Acre-Feet and 1,000 Acre-Feet. The dam has a maximum height of 31 feet and a maximum storage capacity of 590 Acre-Feet. Therefore, the dam is classified as "Small" in size.

d. Hazard Classification - "High"

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the hazard classification for the dam is "High". A dam failure analysis indicates that a breach of

Seymour Reservoir No. 2 Dam would result in Seymour Reservoir No. 1 Dam, located immediately downstream, being overtopped by approximately 9 feet. For computational purposes, the downstream dam was assumed not to fail due to overtopping. The depth of flow in the stream in the area of four downstream houses prior to dam breach is 3 feet, based on the maximum spillway capacity of 550 cfs. The peak flow in this area due to dam breach is 21,500 cfs, equivalent to a depth of flow of 12 feet or approximately 4.6 feet above the sill elevation of the four houses. The dam failure could result in the loss of more than a few lives and an economic loss associated with the failure of the downstream dam.

e. Ownership

Former Owner: The Seymour Water Company

Present Owner: The Bridgeport Hydraulic Company
835 Main Street
Bridgeport, Connecticut 06609
(203) 367-6621

f. Operator

George Smith, Manager
Valley Division
The Bridgeport Hydraulic Company
70 New Haven Road
Seymour, Connecticut 06483
(203) 888-4511

g. Purpose of Dam

The dam impounds Seymour Reservoir No. 2, a storage reservoir for public water supply for the Valley Division of the Bridgeport Hydraulic Company.

h. Design and Construction History

The orignial dam is believed to have been constructed in 1931 by C.W. Blakeslee and Sons. Between 1947 and 1948 the dam was raised in order to increase the capacity of the reservoir. The raising of the dam was designed by Clarence Blair Associates, Inc. and constructed by C.W. Blakeslee and Sons.

i. Normal Operational Procedures

The dam impounds Seymour Reservoir No. 2, a storage reservoir for public water supply. The low level outlet or blowoff normally discharges to Seymour Reservoir No. 1 through a fountain aerator. A bypass blowoff around Reservoir No. 1 is usually operated once a month during the summer to maintain water quality. The water level is maintained essentially constant by regulating the flow from two upper reservoirs and by driving wedges between the flashboards to allow water to flow through them.

1.3 Pertinent Data

a. Drainage Area

The drainage area consists of 1.15 square miles of rolling, wooded terrain, the majority of which is either owned by the Bridgeport Hydraulic Company, or designated as State Forest.

b. Discharge at Damsite

The discharge at the damsite is over a 25.75 foot long concrete overflow spillway. Outlet works consist of a 12-inch cast iron low level outlet or blowoff pipe through the dam which normally outlets directly to Seymour Reservoir No. 1. A bypass enables the blowoff to discharge to the stream below Reservoir No. 1.

1.	Outlet Works (conduits) Size:	12-inch
	Invert Elevation:	341.2
	Discharge Capacity:	6 cfs
2.	Maximum Known Flood at Damsite:	Unknown
3.	Ungated Spillway Capacity* at Top of Dam:	500 cfs
	Elevation:	368.5**
4.	Ungated Spillway Capacity* at Test Flood Elevation:	550 cfs
	Elevation:	368.7
5.	Gated Spillway Capacity at Normal Pool Elevation:	N/A
	Elevation:	N/A
6.	Gated Spillway Capacity at Test Flood Elevation:	N/A
	Elevation:	N/A
7.	Total Spillway Capacity* at Test Flood Elevation:	550 cfs
	Elevation:	368.7
8.	Total Project Discharge* at Top of Dam:	500 cfs
	Elevation:	368.5**
9.	Total Project Discharge at Test Flood Elevation:	550 cfs
	Elevation:	368.7

*without flashboards
**low point of dam crest

c. Elevation - Feet Above NGVD (formerly MSL Datum of 1929)

1. Streambed at Toe of Dam:	338.0
2. Bottom of Cutoff:	335.0
3. Maximum Tailwater:	339.7
4. Recreation Pool:	N/A
5. Full Flood Control Pool:	N/A
6. Spillway Crest:	365.4
7. Design Surcharge - Original Design:	Unknown
8. Top of Dam:	369.0 Average 368.5 Low Point
9. Test Flood Surcharge:	368.7

d. Reservoir - Length in Feet

1. Normal Pool:	1,900 ft.
2. Flood Control Pool:	N/A
3. Spillway Crest Pool:	1,900 ft.
4. Top of Dam:	1,900 ft.
5. Test Flood Pool:	1,900 ft.

e. Storage - Acre-feet

1. Normal Pool:	520 Acre-Feet
2. Flood Control Pool:	N/A
3. Spillway Crest Pool:	520 Acre-Feet
4. Top of Dam:	590 Acre-Feet
5. Test Flood Pool:	590 Acre-Feet

f. Reservoir Surface - Acres

1. Normal Pool:	23 Acres
2. Flood-Control Pool:	N/A
3. Spillway Crest:	23 Acres
4. Test Flood Pool:	23 Acres
5. Top of Dam:	23 Acres

i. Spillway

1. Type:	Concrete overflow
2. Length of Weir:	25.75 ft.
3. Crest Elevation with Flashboards: without Flashboards:	 367.4 5 ft. at 362.9; 20.75 ft. at 365.4
4. Gates:	N/A
5. Upstream Channel:	N/A
6. Downstream Channel:	Stone paving with surficial layer of concrete
7. General:	Spillway capacity with flashboards - 100 cfs

j. Regulating Outlets

1. Invert:	341.6
2. Size:	12-inch
3. Description:	Cast iron pipe through earth embankment controlled by downstream gate valve
4. Control Mechanism:	Manually operated gate valve
5. Other:	Normally outlets to fountain aerator in Seymour Res. No. 1. Bypass piping & valves available to allow for discharge downstream of Res. No. 1. Capacity = 6 cfs.

g. Dam

1.	Type:	Earth embankment with masonry core wall
2.	Length:	900 ft.
3.	Height:	31 ft.
4.	Top Width:	10 ft.
5.	Side Slopes:	1.5 Horizontal to 1 Vertical
6.	Zoning:	Unknown
7.	Impervious Core:	Masonry core wall (See Plans, Appendix B)
8.	Cutoff:	Core wall extends 5-8 feet below original ground surface
9.	Grout Curtain:	N/A
10.	Other:	Earth dike with masonry core wall along right side of reservoir; length - 800 ft; top width - 15 ft. average height - 6 feet; side slopes - 2 Hor. to 1 Ver.

h. Diversion and Regulating Tunnel

1.	Type:	N/A
2.	Length:	N/A
3.	Closure:	N/A
4.	Access:	N/A
5.	Regulating Facilities:	N/A

ENGINEERING DATA
SECTION 2

2.1 Design Data

Design data consists of cross-sections of the original dam, plans for the raising of the dam prepared by Clarence Blair Associates, Inc., and cross-sections of the dam taken after the raising of the dam. No other design data was available for review.

2.2 Construction Data

Construction data consists of the above noted plans. No other information concerning the construction of the dam was available. Bridgeport Hydraulic Company personnel indicated that the original construction and the raising of the dam was done by C.W. Blakeslee and Sons.

2.3 Operational Data

The water level in the reservoir is recorded daily.

2.4 Evaluation of Data

a. Availability

Existing data was provided by the Bridgeport Hydraulic Company. A list of reference material is given in Appendix B.

b. Adequacy

The information which was available along with the visual inspection, past performance history, and hydrologic and hydraulic calculations were adequate to assess the condition of the facility.

c. Validity

Field inspections and surveys revealed that the dam was constructed substantially as shown on the plans. The bridge that spans the spillway and the roadway from the crest to the toe of the dam

are not shown on the plans. The stone drain at the toe of the dam which is indicated on the drawings was not observed in the field.

VISUAL INSPECTION

SECTION 3

3.1 Findings

a. General

The visual inspection of the dam was conducted on November 28, 1979. At the time of the inspection the water level was approximately 8 inches below the top of the spillway flashboards.

The dam is an earth embankment with a concrete overflow spillway located near the right end of the dam. The outlet works consist of a 12-inch cast iron low level outlet or blowoff pipe through the dam controlled by a downstream gate. A low earth dike is located on the right side of the reservoir.

b. Dam

Main Dam

The exposed part of the upstream slope of the main dam is riprap covered up to within 1 foot of the top of the dam, Photo 1. The top of the dam appears somewhat uneven in elevation as can be seen in Photo 1. Note the dike in the background and the higher elevations in the foreground (near the left abutment) and at the access road to the bridge over the spillway.

The downstream slope is grass covered and appears dry and firm. Some undulations of the surface may indicate past minor sloughing, Photo 2. Occasional animal burrow holes were observed. The ground is wet and marshy downstream of the dam and at the toe, from the left abutment to about the point where the access road reaches the crest of the dam (See Figure 2, Appendix B). It is

not clear if the source of the water is seepage from the dam or surface water runoff that accumulates in the low area downstream of the dam. A ditch was excavated along the toe of the dam downstream of the access road. Flow along the ditch corresponds to drainage of the low area near the left abutment. However, at some locations there is seepage into the ditch from the dam foundation. The flow from the ditch at the access road crossing can be seen in Photo 3, where one can also observe an area of seepage on the right, as evidenced by the orange staining.

Wet areas were observed downstream of the dam in the vicinity of an outlet structure headwall, Photo 4. Two asbestos cement pipes, 12-inch and 10-inch in diameter, are apparently drains for the general area of the outlet structure and were discharging water containing rust-colored floccules typical of seepage water, Photo 5.

Dike

There is an earth dike, on the average of a few feet in height, 10 feet maximum, to the right of the dam. A road exists along the crest of the dike. The elevation of the top of the dike is the same as that of the dam. There are numerous seepage areas at the toe of the dike, Photo 6. The downstream slope of the dike is overgrown with bushes and small trees.

c. Appurtenant Structures

The concrete spillway is located near the right abutment. The concrete weir appears to be in good condition, Photo 7. Flashboards were in place at the time of the inspection, Photos 7 and 8.

The upper part of the training walls is concrete and the lower part is stone masonry, Photo 7. There is some seepage out of the lower part of the left wall, Photo 9. The spillway channel bottom has a stone paving with a thin surficial layer of concrete, Photo 10 and 11. The concrete finish has spalled in some areas. Some water apparently flows through the cracks and spalled area under the pavement. The pavement has been undermined at the end of the paved area.

The outlet pipe or blowoff is controlled by a downstream valve which can be observed at the top of Photo 5. The outlet structure is a fountain aerator located in Seymour Reservoir No. 1.

A steel beam bridge with a wood deck spans the spillway. The bridge appears to be in good conditon, with the exception of the wood curbing, which is missing in one area and loose in another.

d. Reservoir Area

The shore of the reservoir area is thickly wooded. No indications of slope instability were observed in the vicinity of the dam.

e. Downstream Channel

The downstream channel is the natural streambed and discharges into Seymour Reservoir No. 1 about 200 feet downstream of the dam. No significant obstructions to the flow were observed.

3.2 Evaluation

On the basis of the visual inspection, the dam is judged to be in fair condition. The following features could adversely

affect the future integrity of the dam.

1. Potential increase in deterioration of the floor of the spillway channel can lead to instability of the training walls.
2. Seepage exiting immediately downstream of the dam can lead to piping and erosion. Seepage near the outlet structure and headwall could represent leakage from buried outlet pipe(s).
3. The 2-feet of flashboards on the spillway substantially reduces spillway capacity and could cause overtopping of the dam.
4. The absence of an upstream gate on the outlet or blow-off line means that water pressure exists within the pipe where it passes through the dam. Any leaks in this pipe could produce internal erosion problems.

OPERATIONAL AND MAINTENANCE PROCEDURES

SECTION 4

4.1 Operational Procedures

a. General

The water level in the reservoir is maintained essentially constant by regulating the flow from two upstream reservoirs and by driving wedges between the flashboards to allow water to flow through them. The low level outlet to Seymour Reservoir No. 1 is normally left open. The water level in the reservoir is recorded daily. The bypass blowoff around Seymour Reservoir No. 1 is usually operated once a month during the summer to maintain water quality. An inspection of the dam was made by Philip W. Genovese and Associates, Inc., in January 1979. A copy of their report is in Appendix B.

b. Description of Any Warning System in Effect

The dam is monitored during periods of heavy rainfall and if an emergency arose, steps would be taken to notify the downstream residents.

4.2 Maintenance Procedures

a. General

Normal maintenance procedures consist of mowing the grass on the downstream slopes and regrading the roadway across the top of the dam and dike as required. Necessary repairs are also made as required.

b. Operating Facilities

No formal maintenance procedures exist for the operating facilities.

4.3 Evaluation

Present operations and maintenance procedures are satisfactory and should remain in effect, except for the installation of the flashboards. The current practice of having the dam inspected by a qualified, registered engineer should continue, with the inspections being made every year. A maintenance and operations manual should be prepared for the dam and operating facilities.

The warning system which is currently in effect should be formalized and should include monitoring of the dam during extremely heavy rains, and procedures for notifying the proper authorities in the event of an emergency.

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

SECTION 5

5.1 General

Seymour Reservoir No. 2 is the third reservoir in a series of four, and is located upstream of Reservoir No. 1 (See Fig. 1, pg. xii). The dam has a tributary watershed of 1.15 square miles, 0.68 square miles of which are tributary to Reservoir No. 3 upstream. The terrain is "rolling", wooded hills essentially undeveloped, with most of the watershed owned by the Bridgeport Hydraulic Company or designated as State Forest. The concrete overflow spillway has a crest length of 25.75 feet. A 5 foot long x 2.5 foot deep slot in the center of the spillway contains flashboards. In addition, there are 2 feet of flashboards on the entire spillway crest. (See sketch on Page D-2 in Appendix D).

The dam crest is uneven with a low point 3.1 feet above spillway level* (1.1 feet above flashboards). The average crest height of the dam is 3.6 feet above spillway.

5.2 Design Data

No computations were found for the design of the dam or the spillway. An engineering report dated January 2, 1979 gives the spillway capacity as 99 cfs with the flashboards, and 542 cfs without the flashboards.

5.3 Experience Data

There is no known record of the dam ever overtopping.

5.4 Test Flood Analysis

Based on the dam failure analysis, the dam is classified as "High" hazard potential. The size of the dam is "Small".

*elev. 365.4

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the Test Flood should be in the range of 1/2 PMF to PMF depending on the involved risk. A Test Flood equal to 1/2 PMF was selected. Flood routing was started at Seymour Reservoir No. 4 Dam, the upper reservoir in the series. An inflow flood peak of 575 cfs was calculated for the 0.54 square mile watershed at Seymour No. 4 Dam using a peak runoff of 1060 cubic feet per second per square mile (csm) from the guide curve for "rolling" terrain supplied by the Corps of Engineers. A triangular hydrograph was calculated using the methodology given in Design of Small Dams by the Bureau of Reclamation. The peak inflow rate of 575 cfs and a total runoff of 9.5 inches for the 1/2 PMF were used to calculate the inflow hydrograph. The flood was routed through Seymour No. 4 and the outflow was added to the inflow for the 0.14 square mile watershed of Seymour No. 3 to obtain the total inflow hydrograph for Seymour No. 3. Peak inflow was 320 cfs. The flood was routed through Reservoir No. 3 and the outflow was added to the inflow for the 0.48 square mile watershed of Seymour No. 2. Peak inflow to Reservoir No. 2 was 580 cfs. The arithmetical trial-and-error tabular method was used for the routings. All reservoirs were assumed to be initially at spillway level.

The Test Flood was routed through Seymour No. 2 and produced a maximum outflow of 550 cfs, which would overtop the low point in the dam crest by 0.2 feet. The spillway capacity of 500 cfs without any flashboards is equal to 91 percent of the routed Test Flood outflow. The spillway capacity of 100 cfs with flashboards is equal to 18 percent of the Test Flood outflow.

The present use of flashboards creates an unsafe condition. Removing the 2 feet of flashboards above spillway level (elevation 365.4), but leaving the flashboards in the slot would provide a capacity of 390 cfs or 72 percent of the Test Flood outflow. Leveling the dam and dike crests at elevation 369 to provide a minimum height of 3.6 feet above spillway level would increase the spillway capacity, with the flashboards present in the slot, to 490 cfs or 90 percent of the Test Flood outflow.

5.5 Dam Failure Analysis

A dam failure analysis was made using the "Rule of Thumb" guidance provided by the Corps of Engineers. Failure was assumed with the water level at the top of the dam. The dam breach calculations show a peak release of 33,000 cfs into the valley below the dam. The flood wave was routed through Seymour No. 1 and downstream to the confluence with the Naugatuck River. Seymour Reservoir No. 1 Dam would be overtopped by approximately 9 feet. For computational purposes the dam was assumed not to fail due to overtopping.

The depth of flow in the stream in the area of four downstream houses prior to dam breach is 3 feet, based on the maximum spillway capacity of 550 cfs. The peak flow in this area due to the dam breach is 21,500 cfs, equivalent to a depth of flow of 12 feet or approximately 4.6 feet above the sill elevation of the four houses. The dam is classified as "High" hazard potential. A dam failure could result in the loss of more than a few lives and an economic loss associated with the failure of the downstream dam.

The dam breach calculations and the areas of potential flooding are shown in Appendix D.

EVALUATION OF STRUCTURAL STABILITY

SECTION 6

6.1 Visual Observations

The visual inspection did not disclose any indications of structural instability.

6.2 Design and Construction Data

The design and construction data consists of drawings showing a plan and cross sections of the dam, including details for raising the dam to its present height in 1947-1948. The core wall shown in the original sections was extended when the dam was raised. No information is presented on the type of soil in the earth embankment. Thus, the evaluation of stability is based solely on the visual inspection.

6.3 Post-Construction Changes

Since the raising of the dam in 1947-1948, Seymour Reservoir No. 4 has been constructed upstream.

6.4 Seismic Stability

The dam is located in Seismic Zone I and in accordance with the recommended Phase I guidelines does not warrant seismic stability analysis.

ASSESSMENT, RECOMMENDATIONS, & REMEDIAL MEASURES
SECTION 7

7.1 Dam Assessment

a. Condition

On the basis of the visual inspection, the dam is judged to be in fair condition. The future integrity of the dam can be affected by the follwoing:

1. Deterioration of the floor of the spillway channel.
2. Seepage exiting downstream of the dam.
3. The absence of an upstream gate on the low level outlet or blowoff line.

An evaluation of the hydraulic and hydrologic features of the dam determined that the spillway is capable of passing 18 percent of the Test Flood outflow with the flashboards in place. The spillway capacity of 500 cfs without flashboards is equal to 91 percent of the routed Test Flood outflow.

b. Adequacy of Information

The information available was judged to be adequate for performing a Phase I Inspection.

c. Urgency

The recommendations presented in Section 7.2 and 7.3 should be carried out by the owner within one year of receipt of this report, with the exception of the flashboard removal, which should be done immediately.

7.2 Recommendations

The following recommendations should be carried out under the direction of a qualified, registered engineer:

1. Design and construct repairs to the floor of the

spillway channel.

2. Investigate the significance of the seepage observed downstream of the dam; in particular, whether the seepage in the area of the outlet structure is related to leakage from or around the buried low level outlet or blowoff pipe. Design and construct seepage control and/or monitoring measures as needed.
3. Install a gate at the intake of the 12-inch cast iron low level outlet or blowoff.
4. Perform a detailed hydrologic and hydraulic analysis to determine the need for and means to provide additional project discharge capacity.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. The 2 foot flashboards should be removed immediately from the main spillway.
2. The current program of technical inspections by qualified, registered engineers should continue with inspections being made annually. Records of findings and recommendations should be maintained.
3. A formal operations and maintenance manual for the dam and operating facilities should be prepared.
4. A formal warning system should be put into effect and include monitoring of the dam during extremely heavy rains (presently in effect) and procedures for notifying downstream authorities in the event of an emergency.

5. Animal burrows on the dam and dike should be filled in.

6. The top of the dam should be graded to a constant elevation.

7.4 Alternatives

There are no practical alternatives to the above recommendations.

APPENDIX A

VISUAL CHECK LIST WITH COMMENTS

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT: Seymour Reservoir No. 2 Dam

DATE: 11/28/79 TIME: 10:30 a.m. WEATHER: Sunny - Approximately 40°

W.S. ELEVATION: 336.7 U.S. _____ DN.S
8" below top of 24" Flash Boards

	PARTY	DISCIPLINE
1.	Donald L. Smith, P.E. - Roald Haestad, Inc.	Civil/Hydrologist
2.	Ronald G. Litke, P.E. - Roald Haestad, Inc.	Civil Engineer
3.	Gonzalo Castro, Ph.D., P.E. - Geotechnical Engineers, Inc.	Geotechnical Engineer
4.		
5.		
6.		

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam Embankment	GC	Good
2.	Dike Embankment	GC	Fair
3.	Intake Channel Outlet Works-and Structure	RGL,DLS	No intake channel or structure observed
4.	Outlet Structure Outlet Works-and Channel	RGL,DLS,GC	Outlet structure-aerator No outlet channel
5.	Spillway Weir, Outlet Works-Appr. & Disch.	RGL,DLS,GC	No appr. channel. Weir good. Discharge channel fair.
6.	Outlet Works-Service Bridge	RGL,DLS	Good
7.			
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT: Seymour Reservoir No. 2 Dam DATE:

PROJECT FEATURE: Dam Embankment NAME:

DISCIPLINE: Geotechnical Engineer NAME:

AREA ELEVATION	CONDITIONS
DAM EMBANKMENT	
CREST ELEVATION	369 (Average)
CURRENT POOL ELEVATION	366.7
MAXIMUM IMPOUNDMENT TO DATE	Unknown
SURFACE CRACKS	None observed
PAVEMENT CONDITION	N/A
MOVEMENT OR SETTLEMENT OF CREST	Uneven crest elevation
LATERAL MOVEMENT	None observed
VERTICAL ALIGNMENT	Uneven crest elevation
HORIZONTAL ALIGNMENT	Too irregular to judge
CONDITION AT ABUTMENT AND AT CONCRETE STRUCTURES	Good
INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES	N/A
TRESPASSING ON SLOPES	None observed
VEGETATION ON SLOPES	Grass on downstream slope and crest
SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS	Minor sloughing of downstream slope
ROCK SLOPE PROTECTION - RIPRAP FAILURES	None observed
UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES	None observed
EMBANKMENT OR DOWNSTREAM SEEPAGE	Along toe in left side of dam, also in area of outlet structure
PIPING OR BOILS	None observed
FOUNDATION DRAINAGE FEATURES	None known or observed
TOE DRAINS	Possibly some drainage near outlet structure
INSTRUMENTATION SYSTEM	None known

PERIODIC INSPECTION CHECK LIST

PROJECT: Seymour Reservoir No. 2 Dam DATE: 11/28/79

PROJECT FEATURE: Dike Embankment NAME:

DISCIPLINE: Geotechnical Engineer NAME: GC

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	
CREST ELEVATION	369 (Average)
CURRENT POOL ELEVATION	366.7
MAXIMUM IMPOUNDMENT TO DATE	Unknown
SURFACE CRACKS	None observed
PAVEMENT CONDITION	N/A
MOVEMENT OR SETTLEMENT OF CREST	None observed
LATERAL MOVEMENT	None observed
VERTICAL ALIGNMENT	Crest elevation the same as that of the dam.
HORIZONTAL ALIGNMENT	Too irregular to judge
CONDITIONS AT ABUTMENT AND AT CONCRETE STRUCTURES	Good
INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES	N/A
TRESPASSING ON SLOPES	None observed
VEGETATION ON SLOPES	Bushes and trees on downstream slope
SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS	None observed
ROCK SLOPE PROTECTION - RIPRAP FAILURE	None observed
UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES	None observed
EMBANKMENT OR DOWNSTREAM SEEPAGE	Extensive seepage areas at toe
PIPING OR BOILS	None observed
FOUNDATION DRAINAGE FEATURES	None known
TOE DRAINS	None known
INSTRUMENTATION SYSTEM	None known

PERIODIC INSPECTION CHECK LIST

PROJECT: Seymour Reservoir No. 2 Dam DATE: 11/28/79

PROJECT FEATURE: Outlet Works - Intake Channel and Structure NAME: DLS

DISCIPLINE: Civil Engineer NAME: RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
A. APPROACH CHANNEL:	No approach channel visible
SLOPE CONDITIONS	
BOTTOM CONDITIONS	
ROCK SLIDES OR FALLS	
LOG BOOM	
DEBRIS	
CONDITION OF CONCRETE LINING	
DRAINS OR WEEP HOLES	
B. INTAKE STRUCTURE:	No intake structure visible
CONDITION OF CONCRETE	
STOP LOGS AND SLOTS	

PERIODIC INSPECTION CHECK LIST

PROJECT: Seymour Reservoir No. 2 Dam DATE: 11/28/79

PROJECT FEATURE: Outlet Works - Outlet Structure and Channel NAME: GC

DISCIPLINE: Geotechnical/Civil Engineer NAME: KGL,DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	No outlet channel
GENERAL CONDITION OF CONCRETE	Outlet structure consists of aerator in Seymour Reservoir No. 1
RUST OR STAINING	
SPALLING	
EROSION OR CAVITATION	
VISIBLE REINFORCING	
ANY SEEPAGE OR EFFLORESCENCE	
CONDITION AT JOINTS	
DRAIN HOLES	None observed
CHANNEL	N/A
LOOSE ROCK OR TREES OVERHANGING CHANNEL	N/A
CONDITION OF DISCHARGE CHANNEL	N/A

COMMENTS:

A bypass pipeline exists around Seymour No. 1 so that the blowoff can also discharge downstream of Seymour Reservoir No. 1.

Head wall at downstream valve was originally installed to support catwalk to operate valve without walking to toe of dam. Plans for catwalk abandoned after construction of road leading to downstream area.

PERIODIC INSPECTION CHECK LIST

PROJECT: Seymour Reservoir No. 2 Dam DATE: 11/28/79

PROJECT FEATURE: Outlet Works - Spillway Weir, Appr. & Disch. NAME: GC

DISCIPLINE: Geotechnical/Civil Engineer NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
A. APPROACH CHANNEL:	No approach channel visible
GENERAL CONDITION	
LOOSE ROCK OVERHANGING CHANNEL	
TREES OVERHANGING CHANNEL	
FLOOR OF APPROACH CHANNEL	
B. WEIR AND TRAINING WALLS:	
GENERAL CONDITION OF CONCRETE	Good. Upper portion of training walls are concrete. Lower are stone masonry.
RUST OR STAINING	None observed
SPALLING	None observed
ANY VISIBLE REINFORCING	No
ANY SEEPAGE OR EFFLORESCENCE	Minor efflorescence on right tr.wall, Seepage in left portion
DRAIN HOLES	None observed, but there are openings in stone masonry part of walls
C. DISCHARGE CHANNEL:	
GENERAL CONDITION	Fair
LOOSE ROCK OVERHANGING CHANNEL	None observed
TREES OVERHANGING CHANNEL	None observed
FLOOR OF CHANNEL	Deteriorated concrete
OTHER OBSTRUCTIONS	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT: Seymour Reservoir No. 2 Dam DATE: 11/28/79

PROJECT FEATURE: Outlet Works - Service Bridge NAME: RGL

DISCIPLINE: Civil Engineer NAME: DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SERVICE BRIDGE	
A. SUPER STRUCTURE:	
BEARINGS	Steel beams bear on concrete
ANCHOR BOLTS	None observed
BRIDGE SEAT	Good
LONGITUDINAL MEMBERS	Good
UNDER SIDE OF DECK	Good (wood deck)
SECONDARY BRACING	N/A
DECK	Good (wood deck)
DRAINAGE SYSTEM	N/A
RAILINGS	None (Wood Curbing)
EXPANSION JOINTS	N/A
PAINT	Good
B. ABUTMENT AND PIERS:	
GENERAL CONDITION OF CONCRETE:	Good
ALIGNMENT OF ABUTMENT	Good
APPROACH TO BRIDGE	Good
CONDITION OF SEAT AND BACKWALL	Good

COMMENTS:

Sections of wood curbing on downstream side improperly secured. Portions of curbing missing on upstream side.

APPENDIX B

ENGINEERING DATA

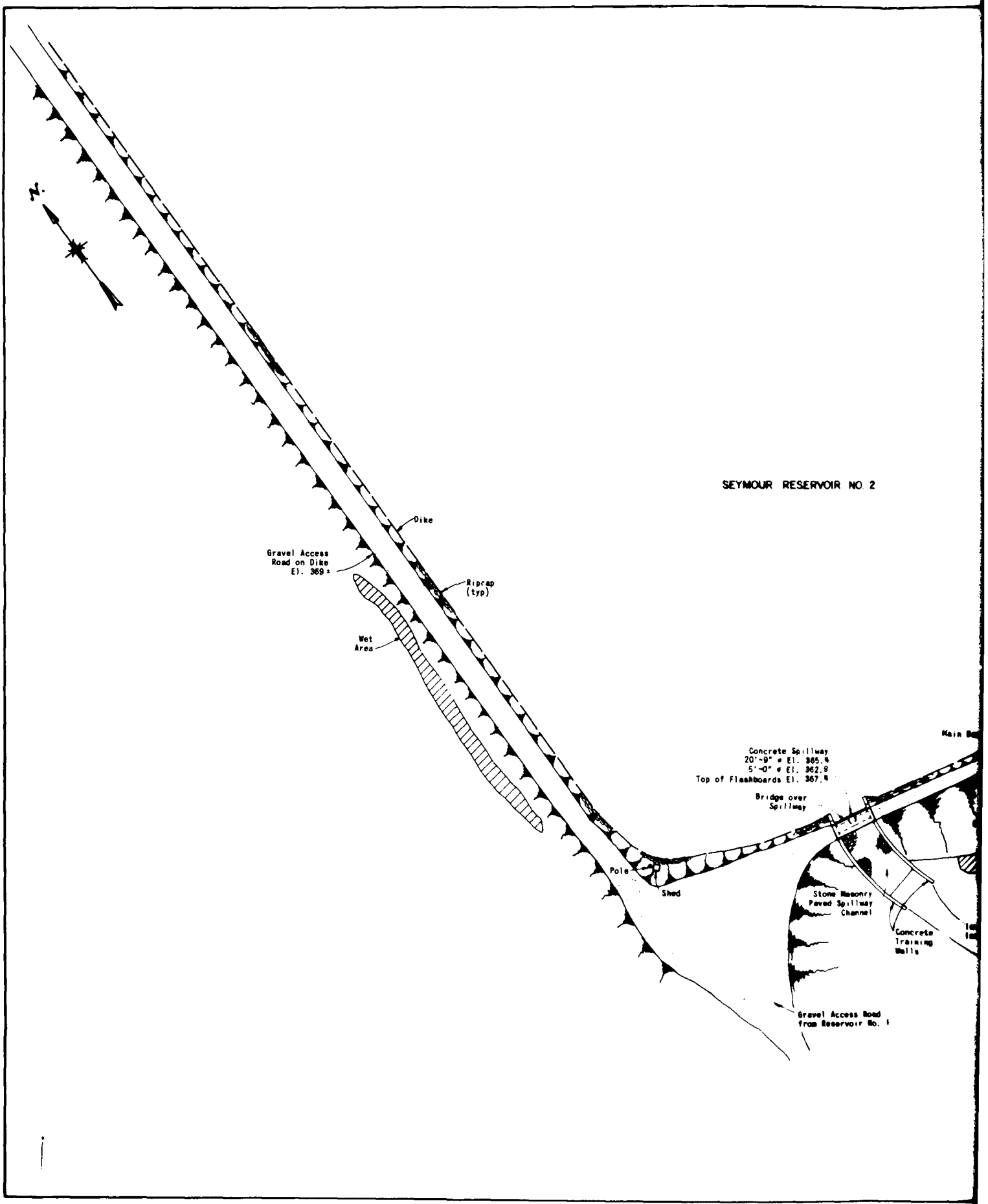
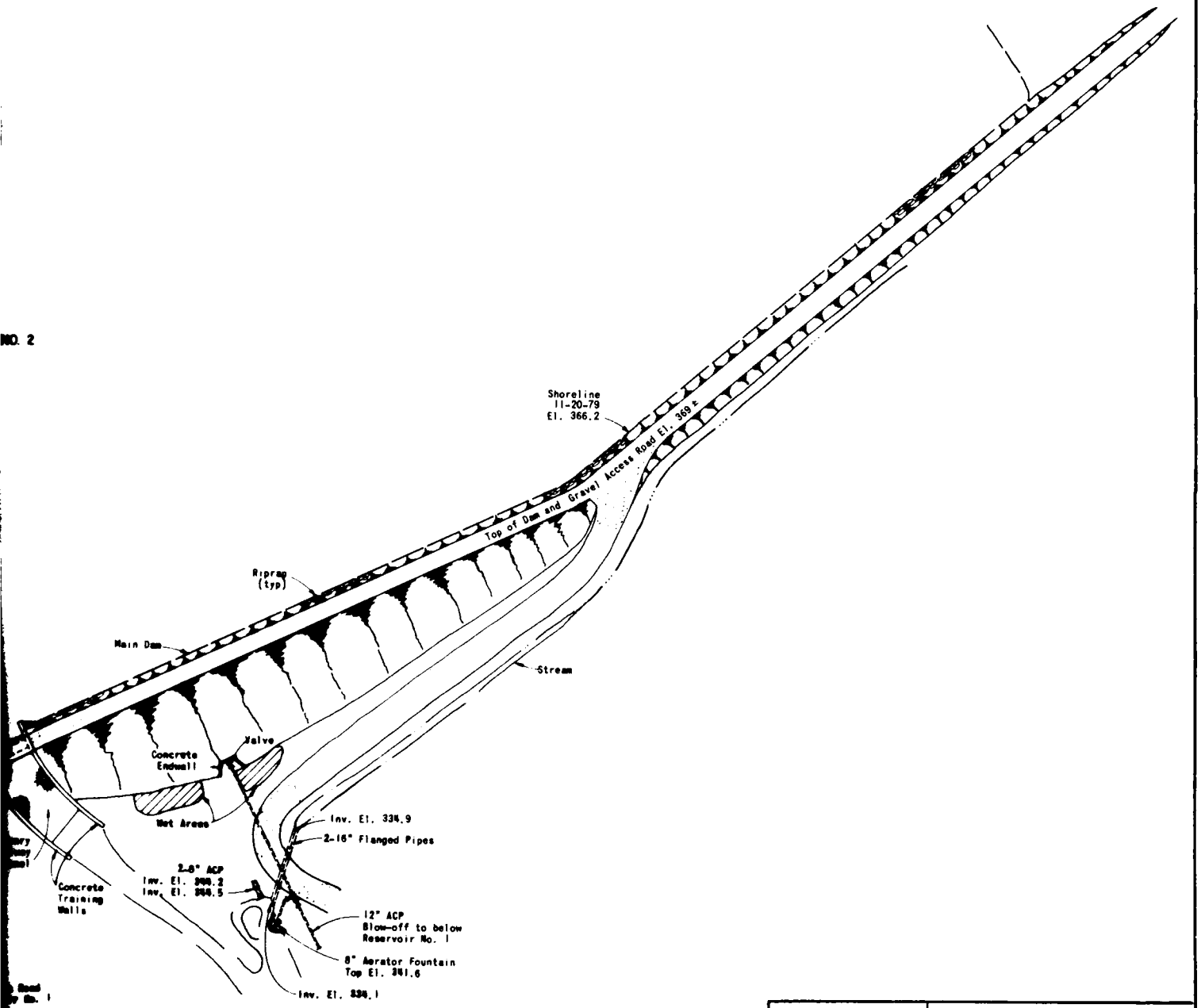

N.
SEYMOUR RESERVOIR NO. 2
Dike
Gravel Access Road on Dike El. 369±
Riprap (typ)
Wet Area
Concrete Spillway
20'-9" ø El. 365.4
5'-0" ø El. 362.9
Top of Flashboards El. 367.4
Bridge over Spillway
Pole
Shed
Stone Masonry Paved Spillway Channel
Concrete Training Walls
Gravel Access Road from Reservoir No. 1

FIGURE 2



ROALD HAESTAD, INC *CONSULTING ENGINEERS* WATERBURY, CONNECTICUT	U S ARMY ENGINEER DIV NEW ENGLAND *CORPS OF ENGINEERS* WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

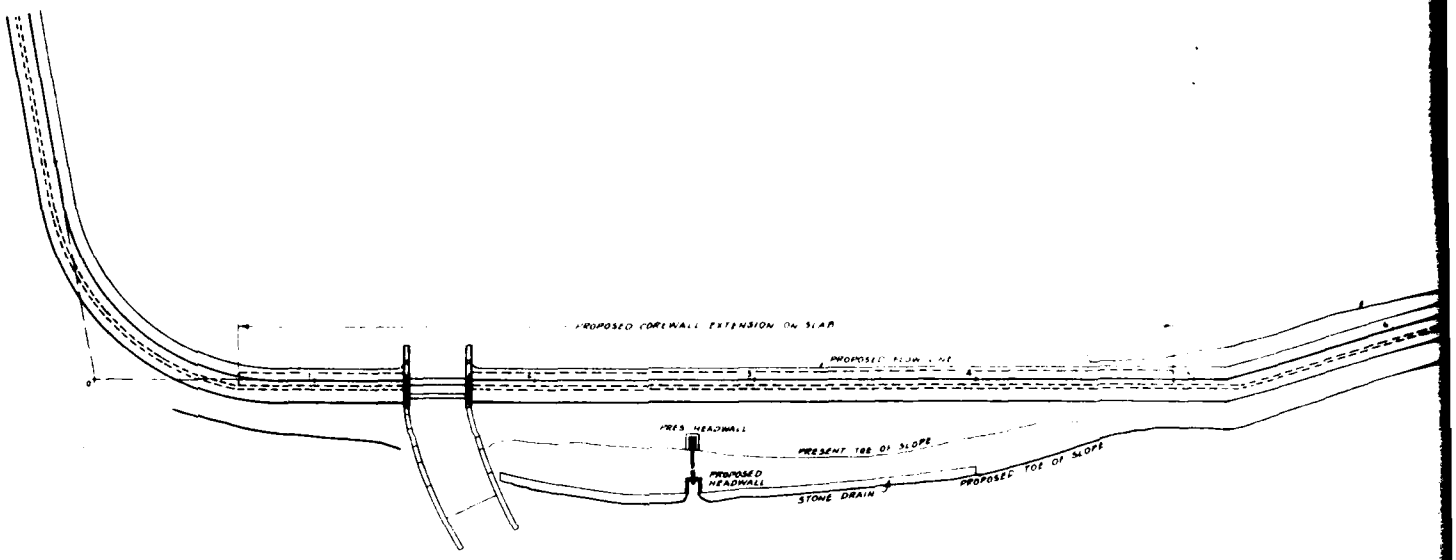
SEYMOUR RESERVOIR NO. 2 DAM

DRAWN	CHECKED	APPROVED	SCALE 1" = 80'	
JRS	DLS		DATE FEB. 1980	PAGE B-1

LIST OF REFERENCES

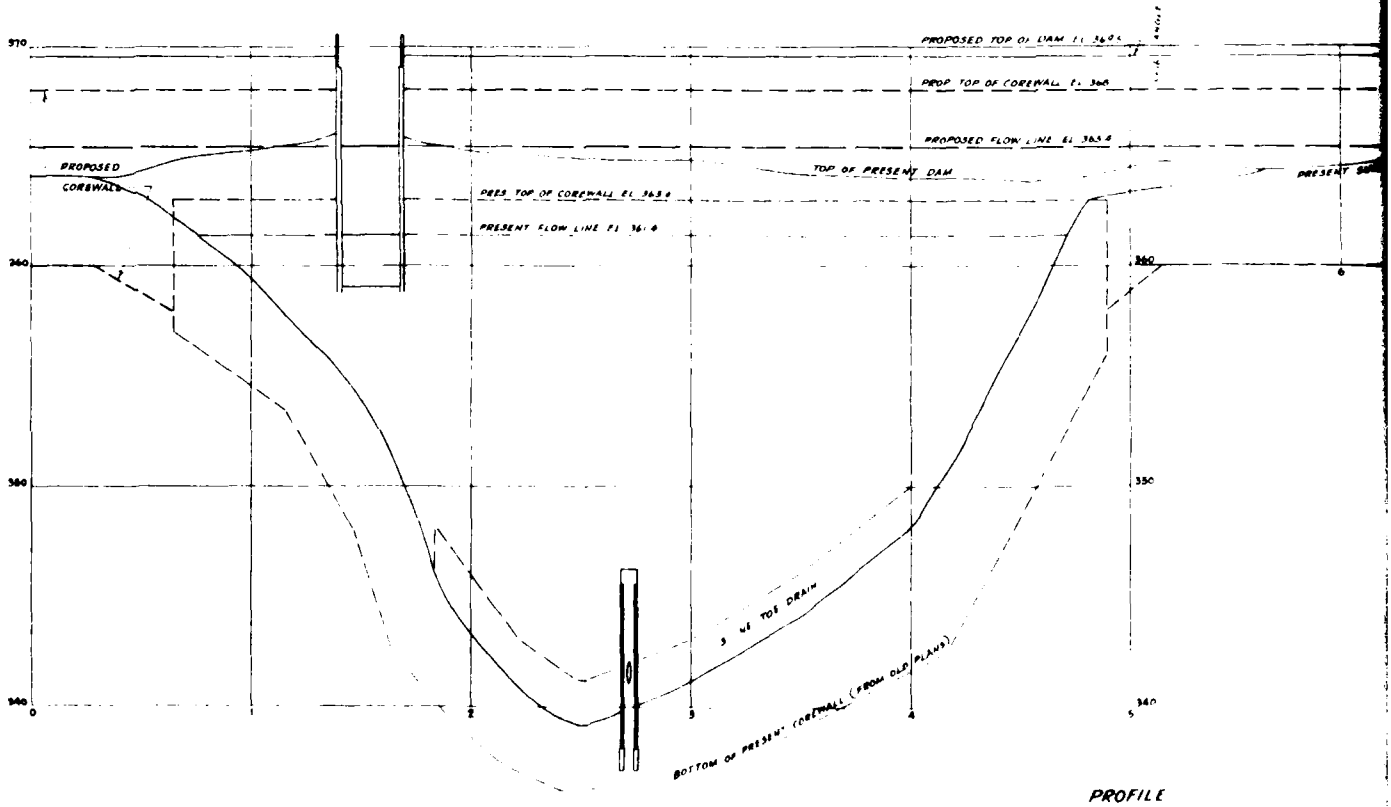
The following references are all located at the Bridgeport Hydraulic Company, 835 Main Street, Bridgeport, Connecticut.

1. Plan, Profile and Sections, "Seymour Water Company, Plan For Raising the Dam at Reservoir No. 2, Town of Oxford, Connecticut", Clarence Blair Associates, Inc. (2 sheets), October 1947.
2. "Seymour Water Company, Reservoir No. 2 Cross Sections Showing Raise of 1947-48", August 1951.
3. "Seymour Water Company, Reservoir No. 2 Cross Sections Taken For 1931 Valuation", August 1951.
4. Contour Map of Reservoir Below Spillway Level, "Seymour Reservoir No. 2, 169,552,200 Gallons", August 1963.
5. Inspection Report, "Seymour Reservoir No. 2", by Philip W. Genovese and Associates, Inc., January 1979.



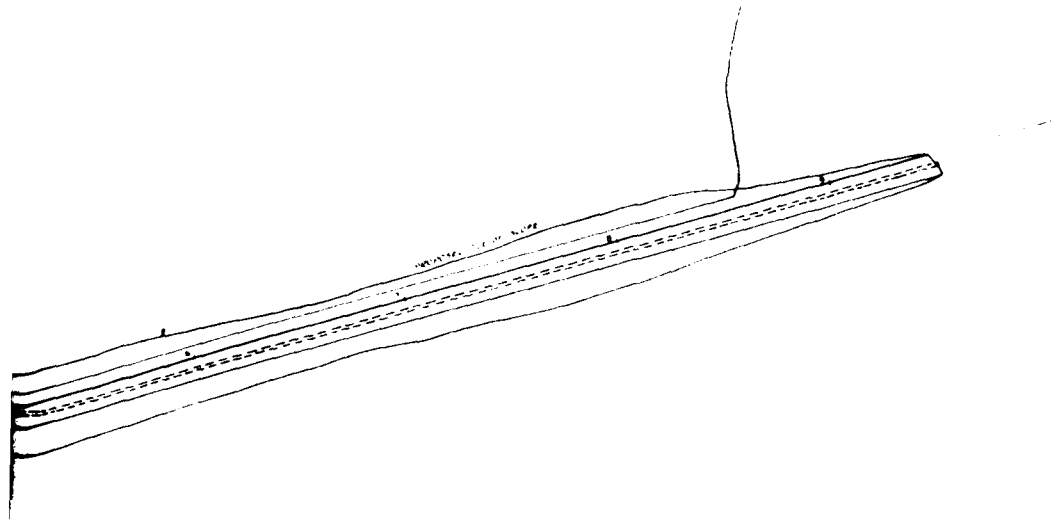
PLAN

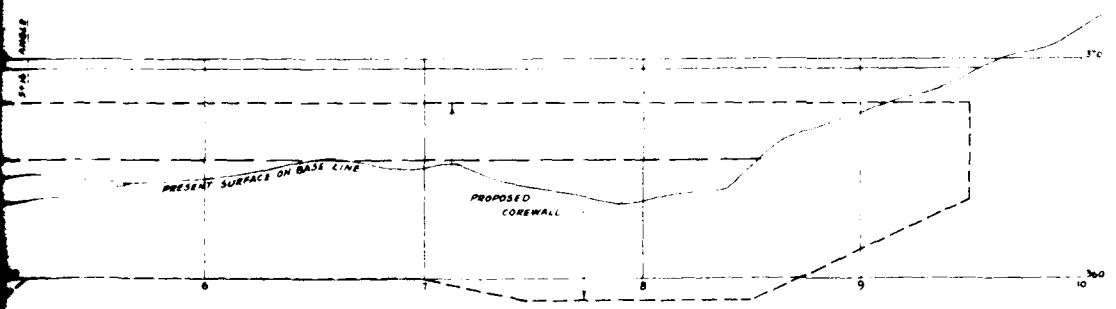
SCALE 1" = 40'



PROFILE

SCALES VERT. 1" = 8'
HOR. 1" = 40'

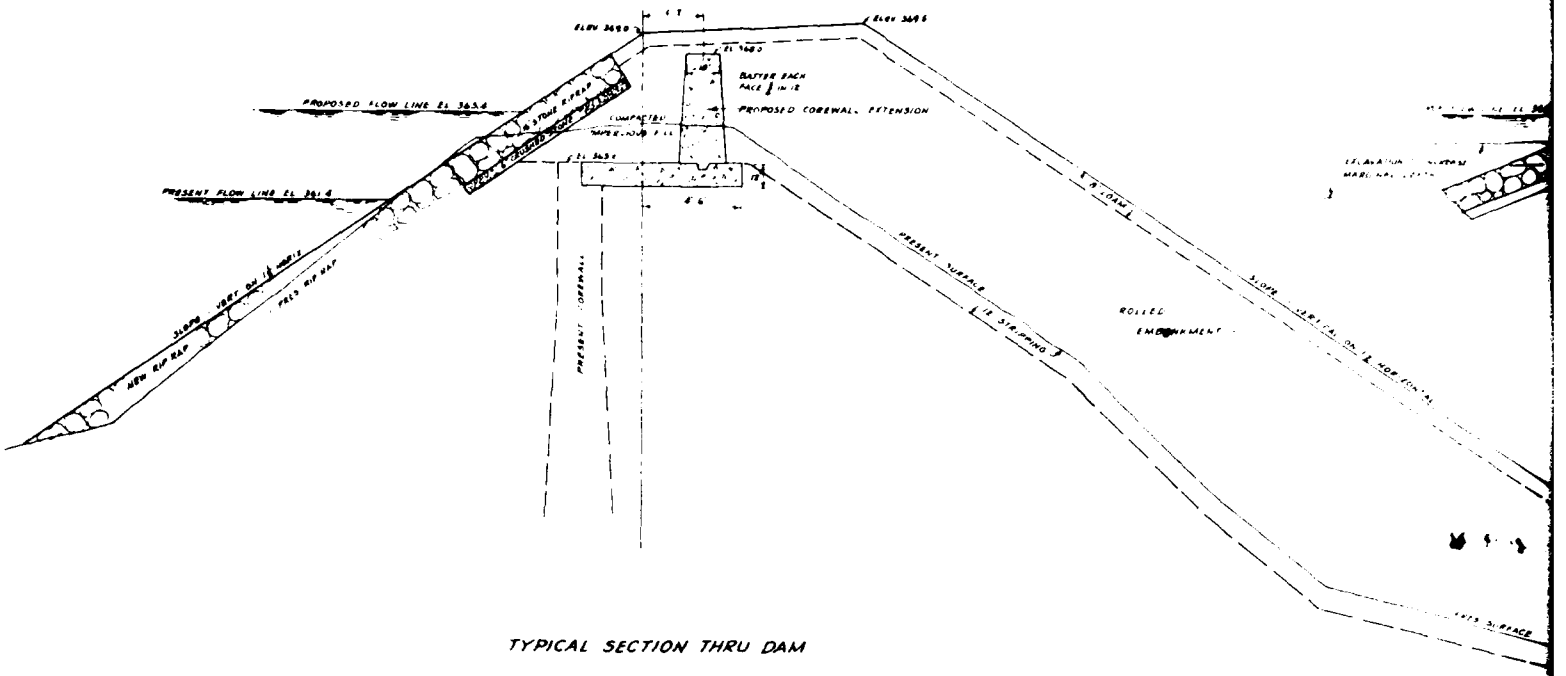




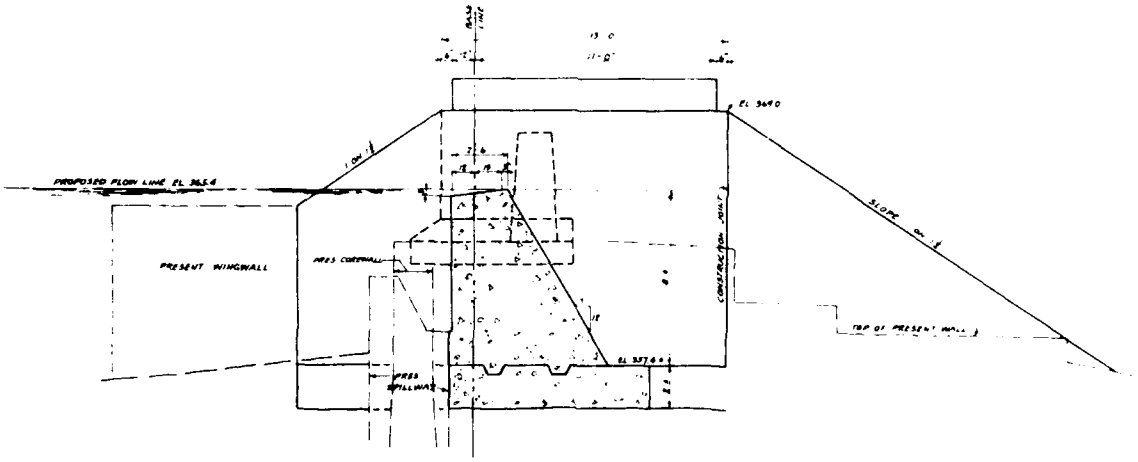
HALF SIZE

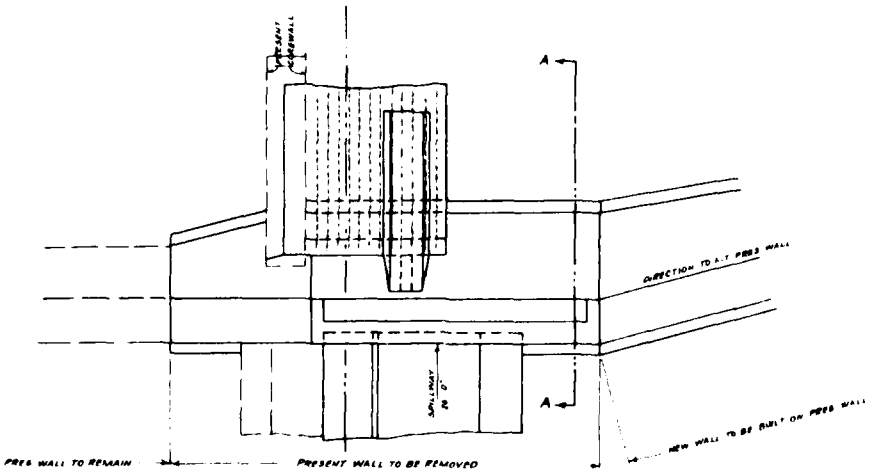
SEYMOUR WATER COMPANY
PLAN FOR RAISING DAM
AT
RESERVOIR NO. 2
TOWN OF OXFORD, CONN.
SCALES AS SHOWN OCTOBER 1947

M 492-1



TYPICAL SECTION THRU DAM

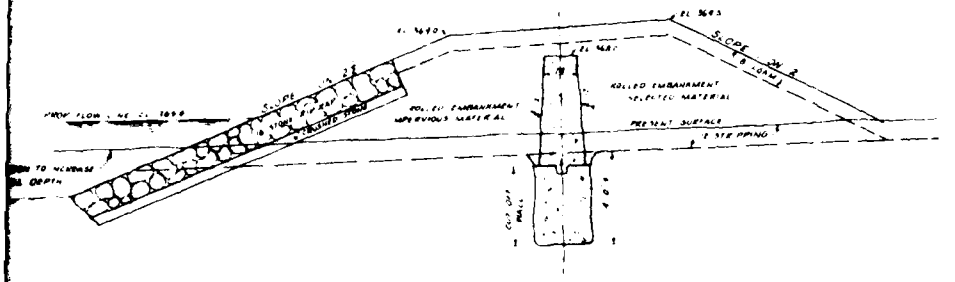




SPILLWAY AND ABUTMENT

RENCE BLAIR ASSOC. ATES
INC.
ENGINEERS
NEW HAVEN CONN.
REGISTERED IN CONNECTICUT

No. 5/6	TRACED BY F.P.
By R.C.B.	APPROVED
	No. M 492



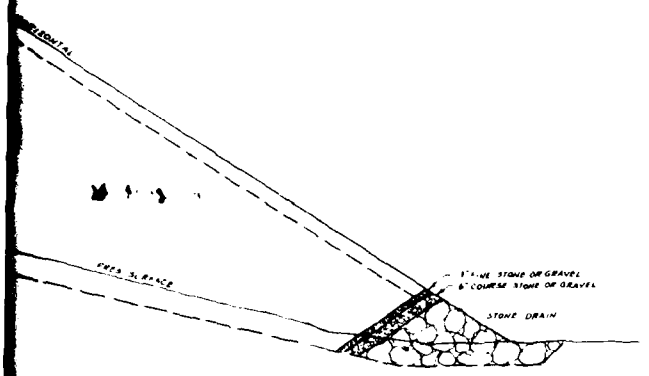
TYPICAL SECTION THRU EAST DIKE

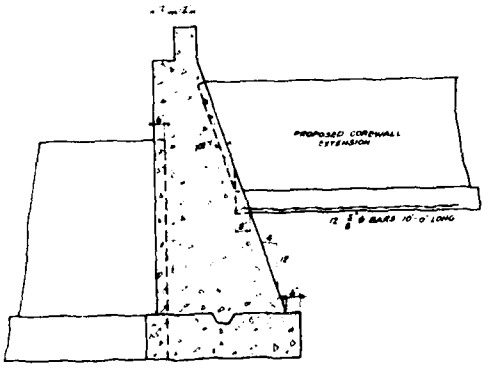
SPECIFICATIONS

Areas upon which embankment is to be placed shall be free of stumps, brush, roots and vegetable matter. Soil or other unsuitable material shall be removed. Embankment shall be of approved material placed in layers not over 8 inches in thickness with each layer thoroughly consolidated by rolling and tamping before the next layer is placed. Pneumatic tampers shall be used to compact the embankment adjoining building walls and on the upstream side of the screen extension. No frozen material shall be placed in the embankment.

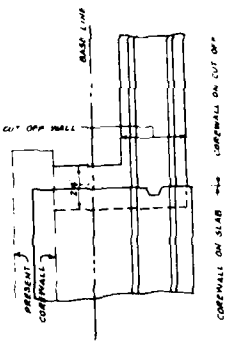
Concrete shall be of a mix approved by the engineer and shall be taken in placing concrete in order to obtain a water tight structure. No concrete shall be placed in freezing weather. Thaw all possible protection.

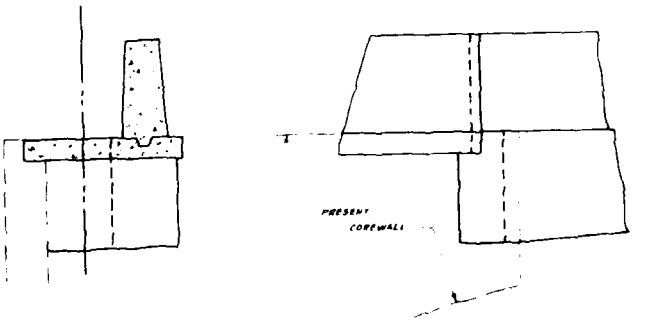
The concrete slab supporting the corewall extension shall be placed on present embankment, compacted if necessary.





SECTION A-A



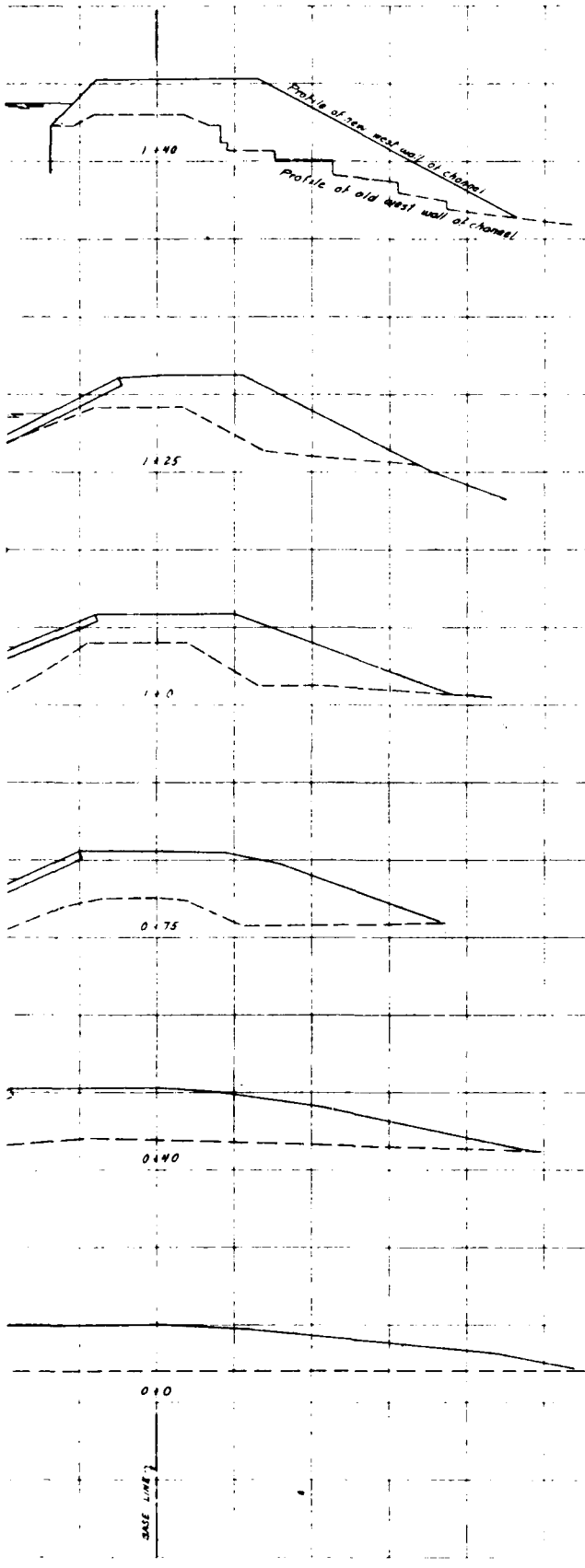


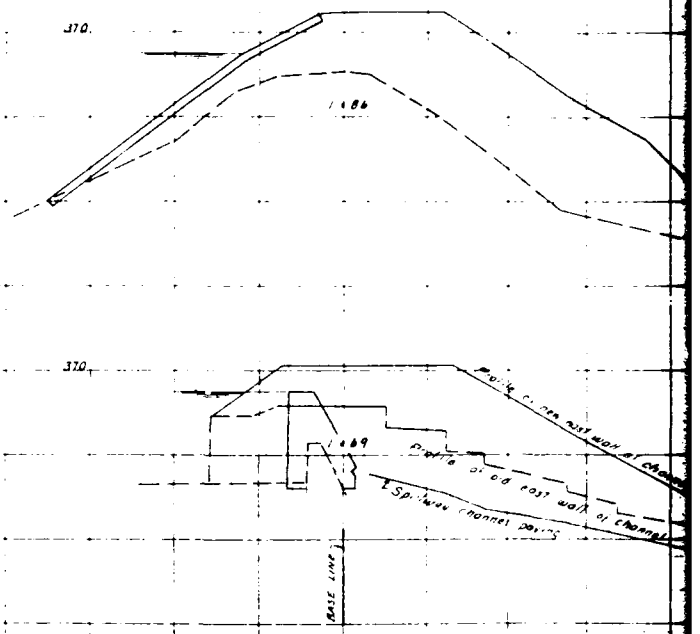
DETAIL AT END OF PRESENT COREWALL

HALF SIZE

SEYMOUR WATER COMPANY

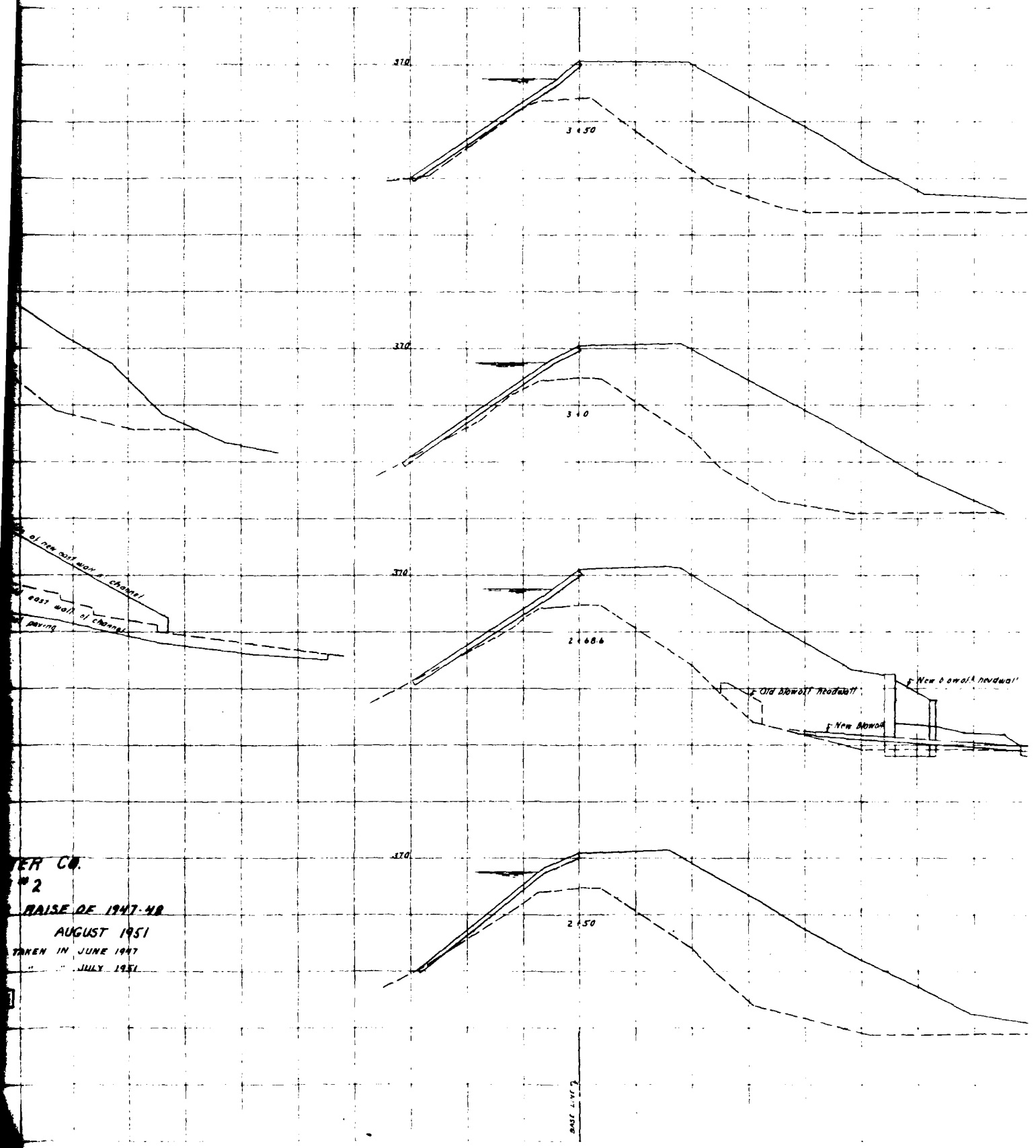
M 992-6





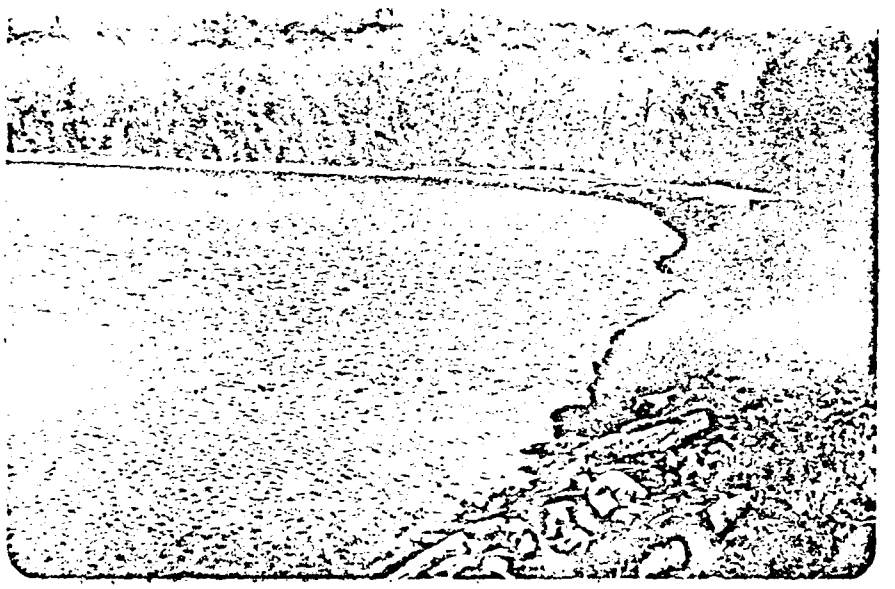
SEYMOUR WATER CO.
RESERVOIR # 2
CROSS SECTIONS SHOWING RAISE OF 1947
SCALE 1 IN. = 10 FT. AUGUST 19
DASH LINES BASED ON SECTIONS TAKEN IN JUNE 1947
SOLID " " " " JULY 19

HALF SIZE



ER CO.
№ 2
RAISE OF 1947-48
AUGUST 1951
TAKEN IN JUNE 1947
" " JULY 1951

SEYMOUR RESERVOIR #2



DAM INSPECTION "Bridgeport Hydraulic Company Dams

Name of Dam: Seymour Reservoir #2

I. PROJECT INFORMATION:

A. AUTHORITY:

This inspection was authorized by a letter from Bridgeport Hydraulic Company dated October, 13, 1978 to Philip W. Genovese & Associates, Inc. Said letter was signed by Edward Stangl, whose title is Manager - Project Engineering. The letter was also signed by Robert Reinert, Vice President of Engineering and Planning.

B. PURPOSE:

The purpose of the study is to perform inspection and evaluation of various Bridgeport Hydraulic Dams in terms of their safety.

C. DESCRIPTION:

Seymour Reservoir #2 and the reservoir dam are located in the Town of Oxford, Connecticut. The reservoir impounds an unnamed tributary which flows several thousand feet from the dam to its confluence with the Naugatuck River. The Seymour Reservoir Dam #2 is primarily an earthen dam, with a core wall and concrete retaining walls. There is a concrete spillway with stop logs.

Plans drawn by Blair Associates of New Haven, Connecticut dated 10/1947 and 8/1951 indicate that the dam was raised in 1947-1948, including a core wall extension. The maximum height of the dam, measured with a hand level is 29 ft.

Dam: Seymour Reservoir #2

D. PERTINENT DATA:

1. Drainage Area: 1.28 square miles 819 acres

2. Discharge at Dam: Does not apply.

3. Elevation: 371 ft MSL/USGS Quad Sheet

4. Reservoir: Length of maximum pool = 1,400 ft ±

5. Storage: Does not apply.

6. Reservoir Surface: Does not apply.

7. Dam:

   Type: Earthen, with core wall, conc. retain. walls

   Length: 1,000 ft ±

   Height: 29 ft ±

   Top Width: 18 ft ±

   Side Slopes: Up Stream unknown (under water)

   Down Stream approx. 2.4 to 1

8. Diversion and Regulating Controls: Does not apply.

9. Spillway: See Attached Sketch

   Type: Concrete & cement rubble masonry

   Length of Weir: See Attached Sketch

   Gates: None

   Up Stream Channel: See Attached Sketch

   Down Stream Channel: See Attached Sketch

Dam: Seymour Reservoir #2

II. ENGINEERING DATA (Existing):

Plans for raising dam (Blair Associates, 1947) and revised plan of dam after raising (Blair Associates, 1951); Cross Sections (Bridgeport Hydraulics) taken June, 1947 and July 1951; and Contours (B.H.) as of August, 1963.

III. VISUAL INSPECTION:

A. FINDINGS:

The earthen embankment appears to be generally stable, with the exception of minor settlement on the down stream side up to approximately 9 inches. Also, there is some seepage at the toe in the area of the old concrete structure. The drainage system appears to be satisfactory. Slope protection of the embankment is in the form of stone rip-rap and armour stone on the up stream side and grass on the down stream side.

B. EVALUATION:

The dam appears to be in good condition with the exception of the deficiencies noted under "FINDINGS".

Dam: Seymour Reservoir #2

IV. OPERATIONAL PROCEDURES:

Does not apply

V. HYDROLOGY AND HYDRAULIC ANALYSES:

The results of the analysis of the hydrology and hydraulics of the dam indicate that the dam would be overtopped at a flow of 542 cfs, which compares to a frequency of approximately 140 years. This would be without the present flashboards. With the flashboards, the dam would be overtopped at 99 cfs, which would be at a computed frequency of approximately 23 years. If we raise the dam with flashboards, to the level of the bottom of the bridge it would be overtopped at a flow of 290 cfs, which would compare to a frequency of approximately 50 years. The hydraulic controls for this structure are:

Control	Flow (cfs)	Frequency (year)
Top of Dam w/o flbds.*	542	140
Top of Dam w/flbds.	99	20
Bottom of Bridge w/o flbds.	~~290~~ 813	~~50~~ 300+
Bottom of Bridge w/flbds.	~~813~~ 290	~~300~~ 50

* flashboards

VI. STRUCTURAL STABILITY:

A. VISUAL OBSERVATION:

1. Embankment: Visual examination of the embankment does not indicate serious structural problems. One small seep was noted and settlement less than 1 foot was observed.

2. Appurtenant Structures: Visual inspection indicates that the spillway and retaining walls are in stable condition.

Dam: Seymour Reservoir #2

B. DESIGN AND CONSTRUCTION DATA:

Does not apply

C. OPERATING RECORDS:

Does not apply

D. POST CONSTRUCTION CHANGES:

Does not apply

E. SEISMIC STABILITY:

The dam is located in siesmic zone #1.

VII. DAM ASSESSMENT:

Visual inspection of the dam indicates generally good condition. This condition designation means the facility requires action with 2 to 3 years by the owner for the specific areas described.

Items that require action are: (1) Filling of areas of settlement; (2) Monitoring of seeps; (3) Raising of dam; (4) Further investigation of the entire series of Seymour dams in respect to breaching and potential down stream damage to relatively new development on Pine Bridge Road.

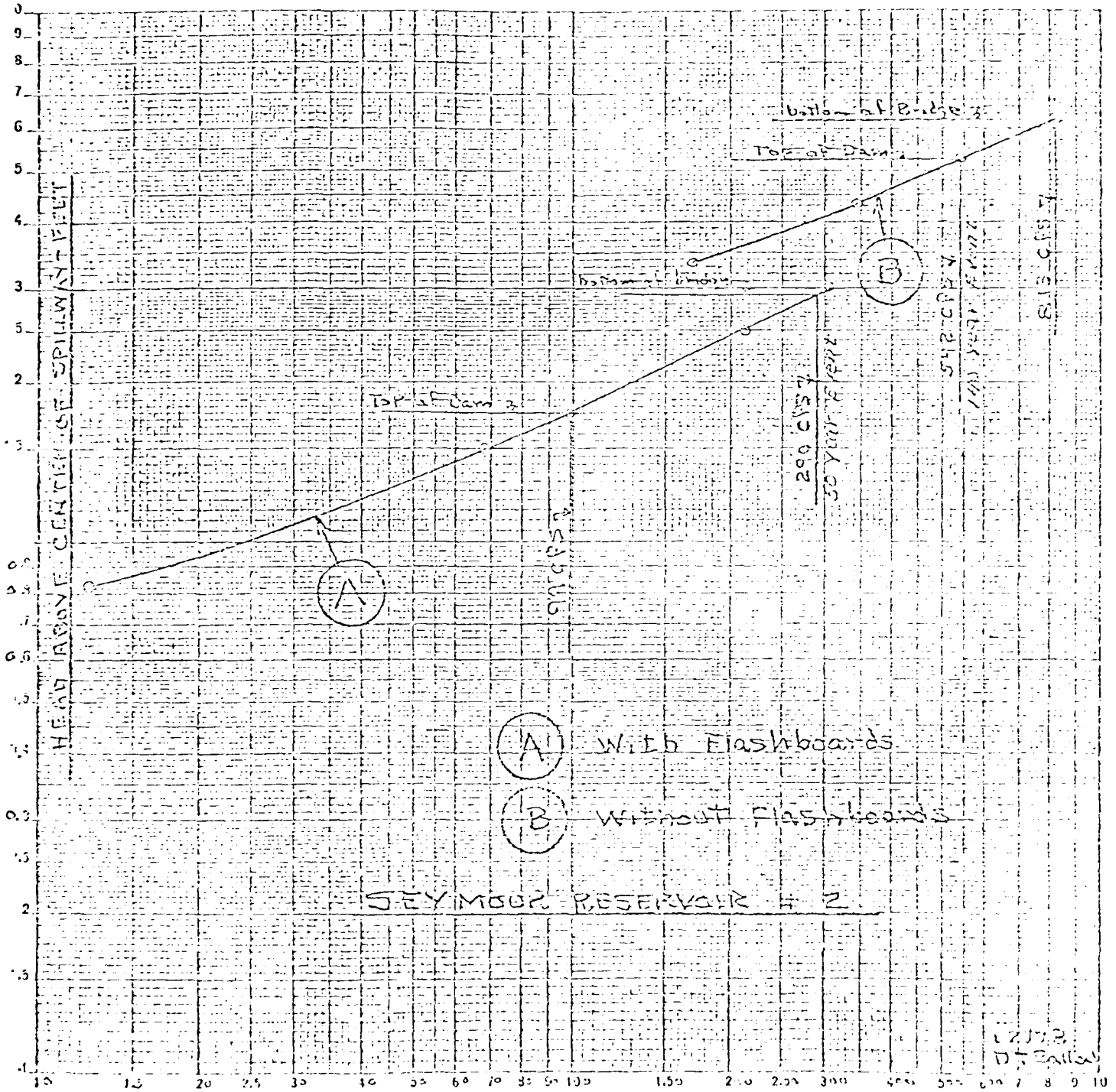
Areas of settlement should be backfilled with suitable fill material and appropriate grass cover planted.

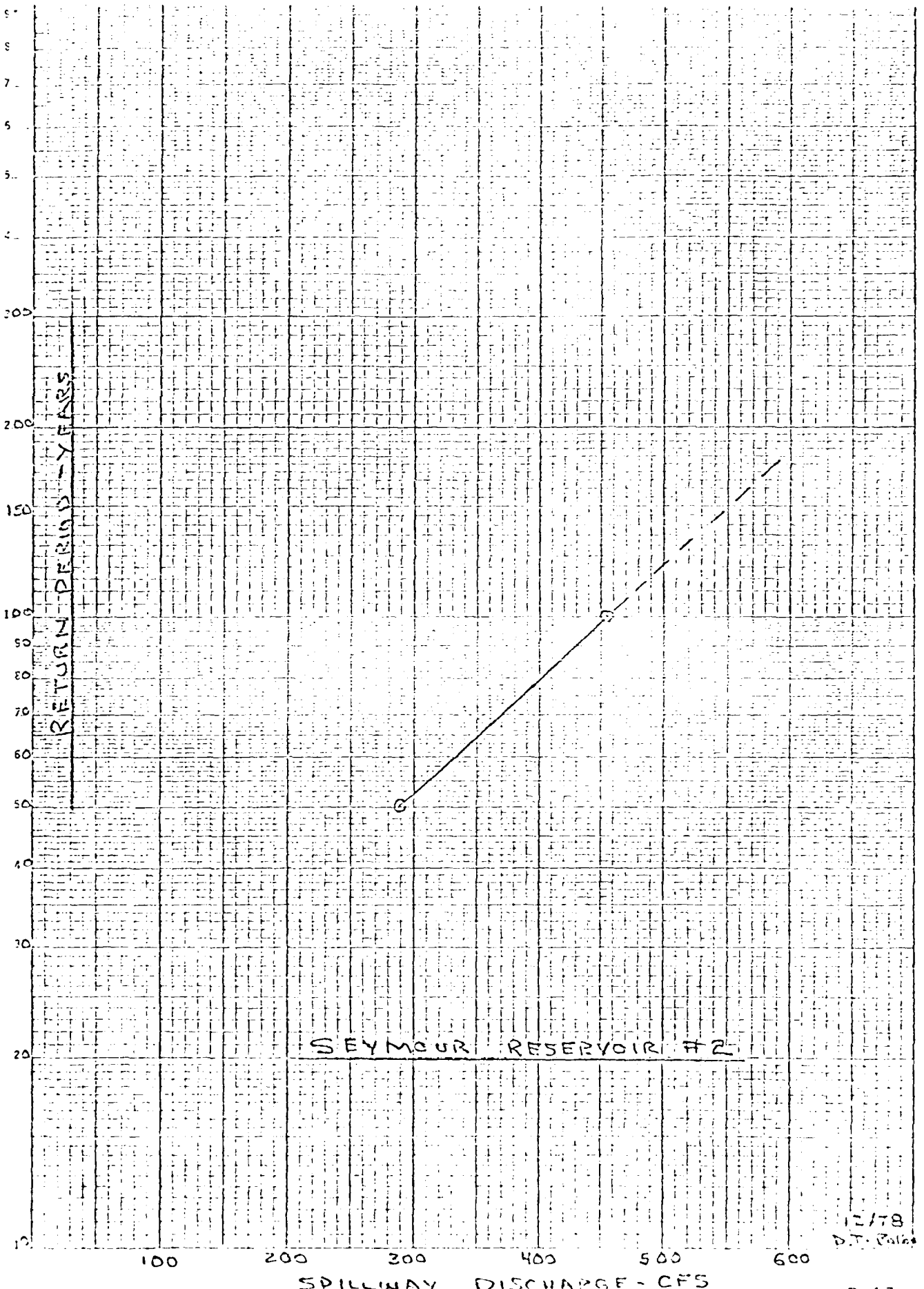
Seepage should be monitored on a monthly basis and records maintained on quantity, color and solids contents (photographs are recommended);

The dam should be raised to an elevation to prevent overtopping at a frequency less than the existing condition which indicates the dam would be overtopped at a return period of 20 years with flashboards or 50 years without flashboards.

Prepared by: Robert L. Jones, P.E.

Project Engineer

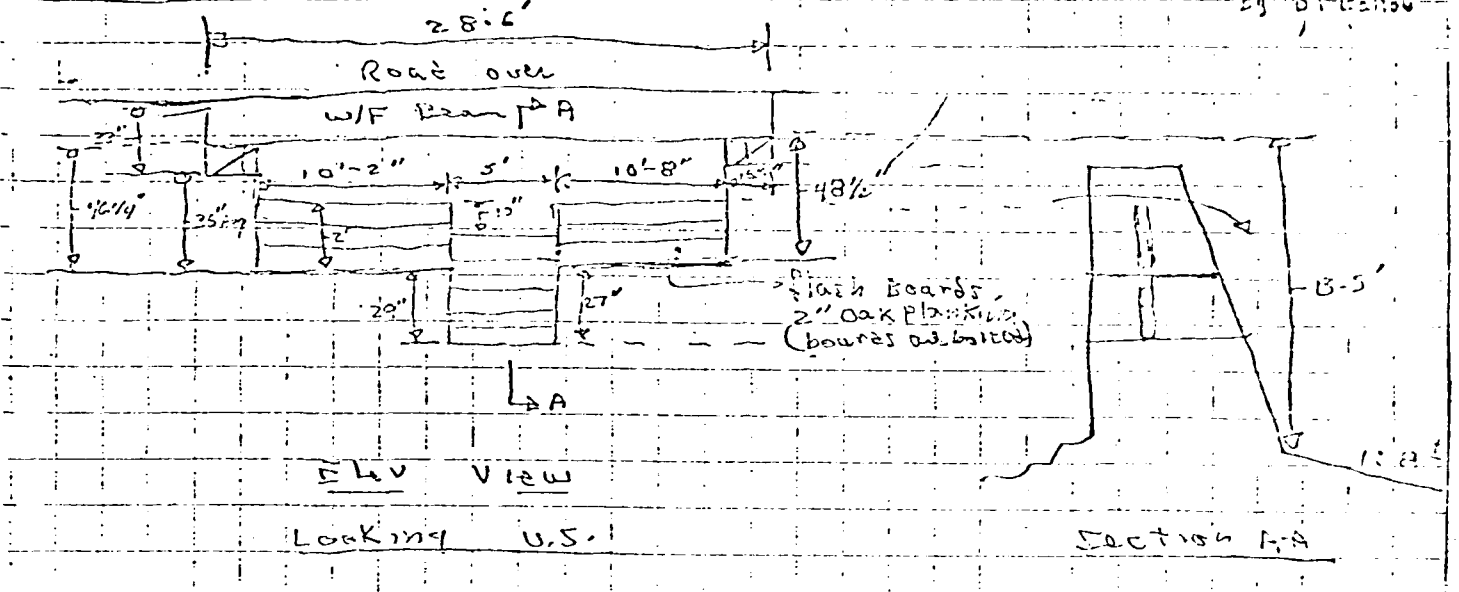

HEAD ABOVE CREST OF SPILLWAY - FEET
Top of Dam
Bottom of Bridge
Top of Dam
A
B
A1 With Flashboards
B Without Flashboards
SEYMOUR RESERVOIR # 2
SPILLWAY DISCHARGE - CFS



Seymour Reservoir #2

11/7/78

By DT Hanson



Elev View Looking U.S.

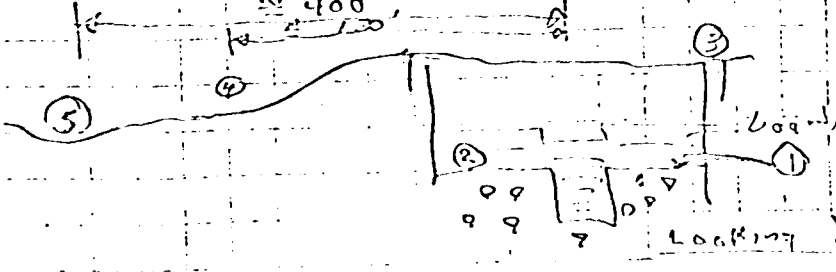
Section A-A

Seymour Reservoir #2

11/25/78

Oxbow Ck.

	B.S	F.S	Elev
①	9.97		
②		10.05	
③		4.33	
④		6.48	
⑤		9.05	



W. Spwy Crest

Earth Crest

Conc & Brickland

Dam Low point

Dam Low point

9.97

-7.05

2.92'

+2.00 boards

.92'

APPENDIX C

PHOTOGRAPHS

SEYMOUR RESERVOIR NO. 2

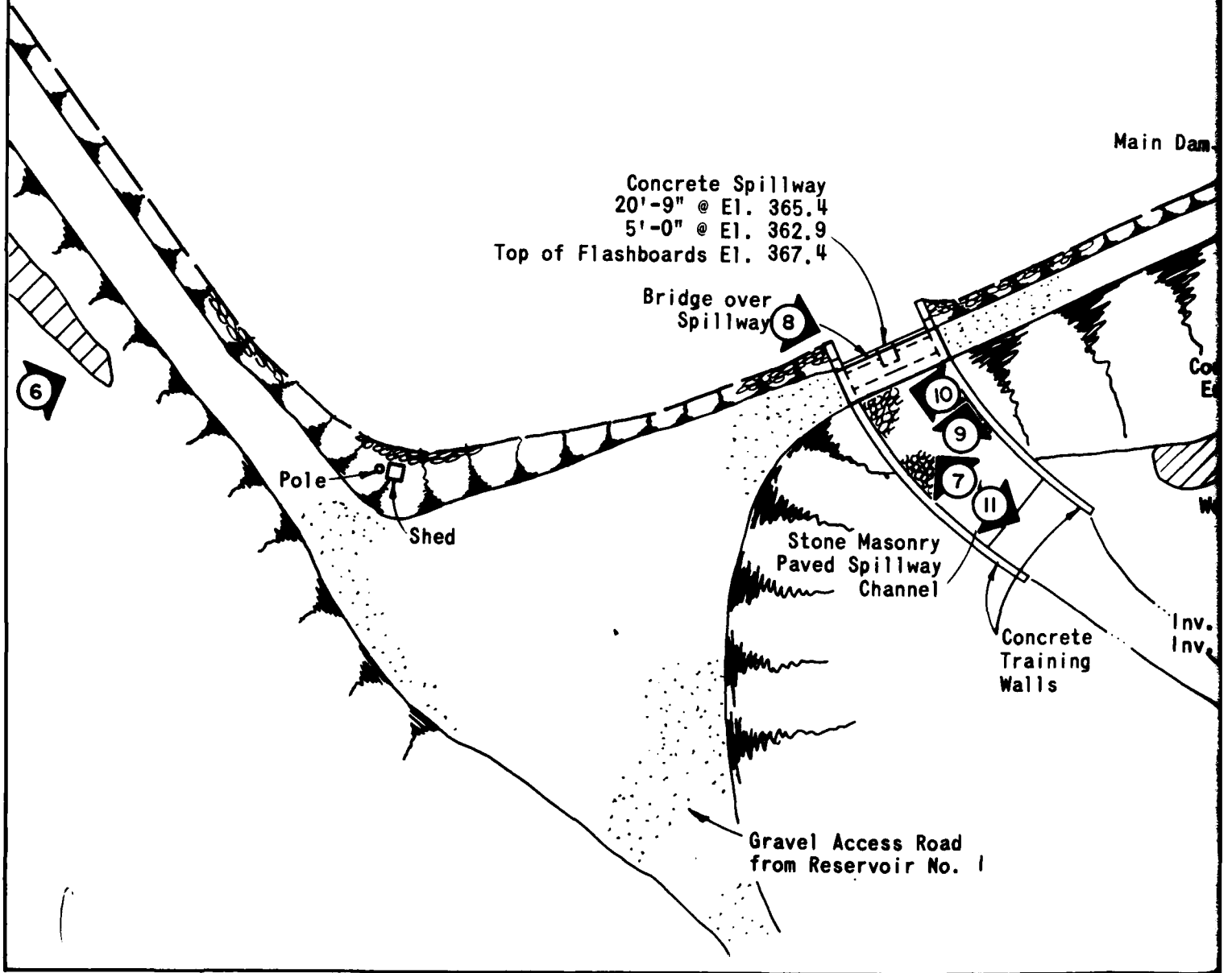
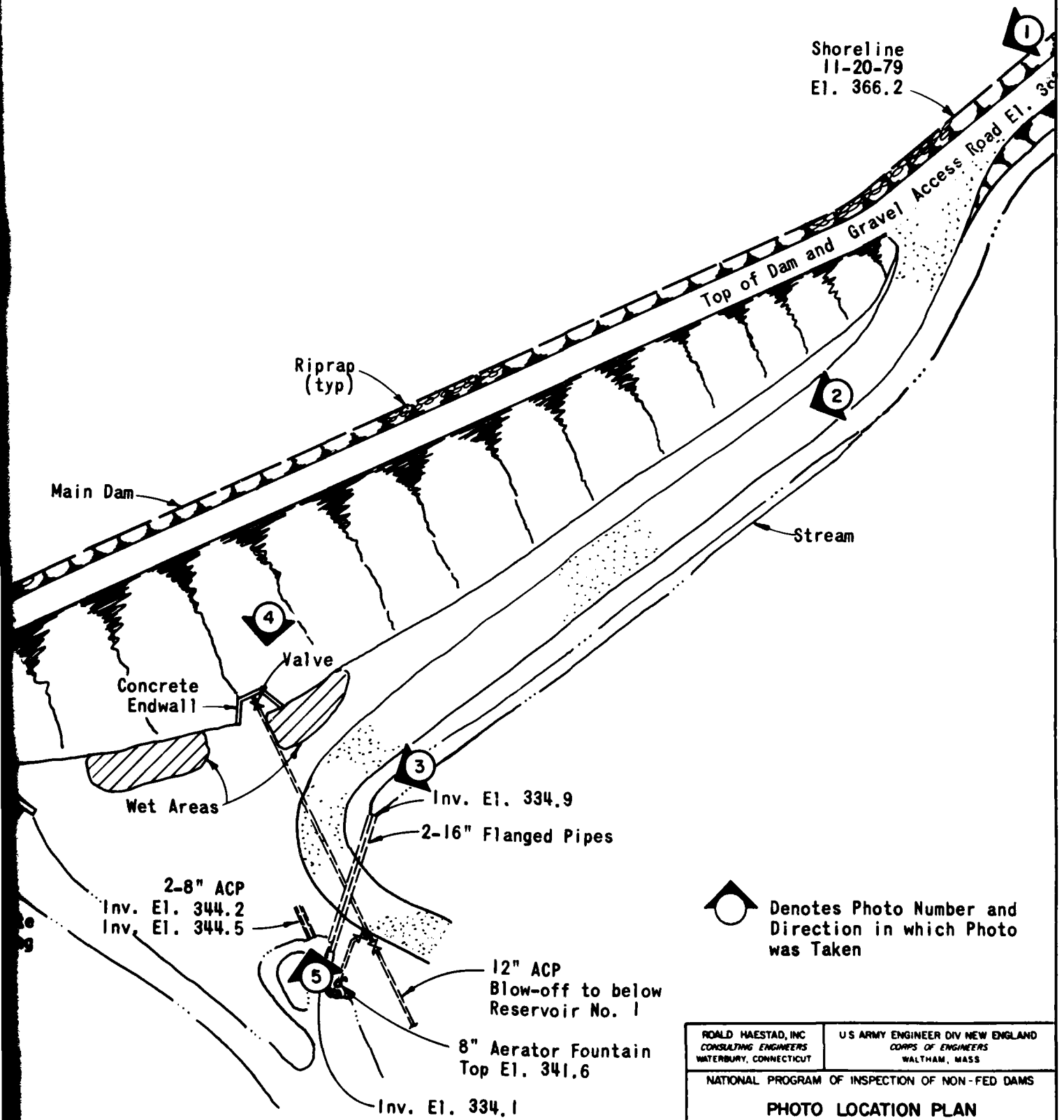


FIGURE 3



ROALD HAESTAD, INC CONSULTING ENGINEERS WATERBURY, CONNECTICUT	US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PHOTO LOCATION PLAN

SEYMOUR RESERVOIR NO 2 DAM

OXFORD, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALES 1" = 40'
JRS	DLS		DATE FEB 1980 PAGE C-1

PHOTO NO. 1

DAM AS VIEWED FROM LEFT ABUTMENT
NOTE UNEVEN CREST ELEVATION AND DIKE IN BACKGROUND

PHOTO NO. 2

DOWNSTREAM SLOPE OF EMBANKMENT,
NOTE SURFACE UNDULATIONS

US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	SEYMOUR RES. NO. 2 DAM TR. TO HEMP SWAMP BROOK OXFORD, CONNECTICUT CT 00324 25 NOV '79
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 3

FLOW FROM DITCH ALONG THE TOE OF THE LEFT PART OF THE DAM
NOTE SEEPAGE AT RIGHT IN RUST-COLORED AREA

PHOTO NO. 4

WET AREA DOWNSTREAM OF
OUTLET STRUCTURE HEADWALL

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	SEYMOUR RES. NO. 2 DAM TR. TO BEMP CAMP BROOK OXFORD, CONNECTICUT CT 00324 28 NOV 79

PHOTO NO. 5

DISCHARGE FROM
TWO ASBESTOS CEMENT PIPES

PHOTO NO. 6

SEEPAGE AT
TOE OF DIKE

US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	SEYMOUR RES. NO. 2 DAM TR. TO HEMP SWAMP BROOK OXFORD, CONNECTICUT CT 00324 28 NOV '79
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 7

VIEW OF SPILLWAY FROM DISCHARGE CHANNEL

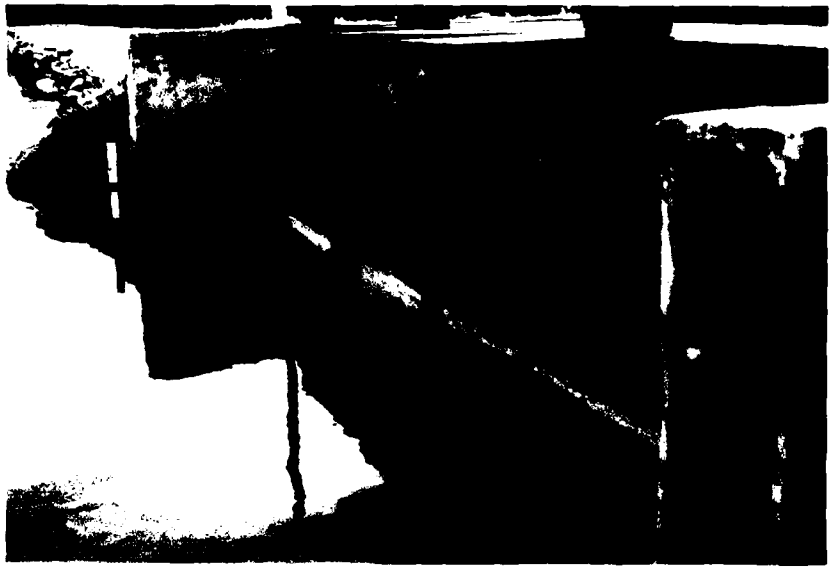


PHOTO NO. 8

SPILLWAY, SERVICE BRIDGE
AND FLASHBOARDS

U S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	SEYMOUR RES. NO. [illegible] AM TR. TO [illegible] AMP [illegible] OXFORD, CONNECTICUT CT 00324 28 NOV '79
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

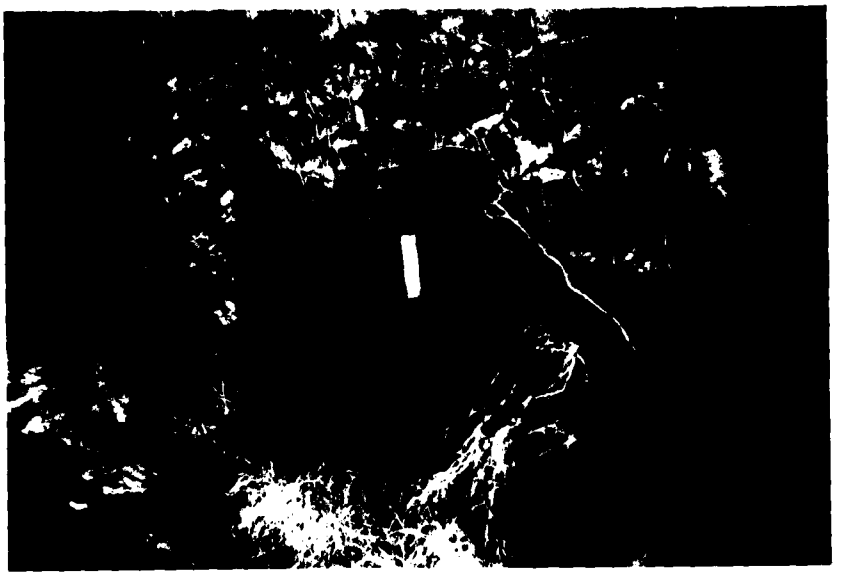


PHOTO NO. 9

SEEPAGE FROM LOWER PART OF
LEFT SPILLWAY TRAINING WALL

PHOTO NO. 10

DETERIORATION OF SPILLWAY DISCHARGE
CHANNEL FLOOR

US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	SEYMOUR RES. NO. 2 DAM TR. TO HEMP SWAMP BROOK OXFORD, CONNECTICUT CT 00324 28 NOV '79
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 11

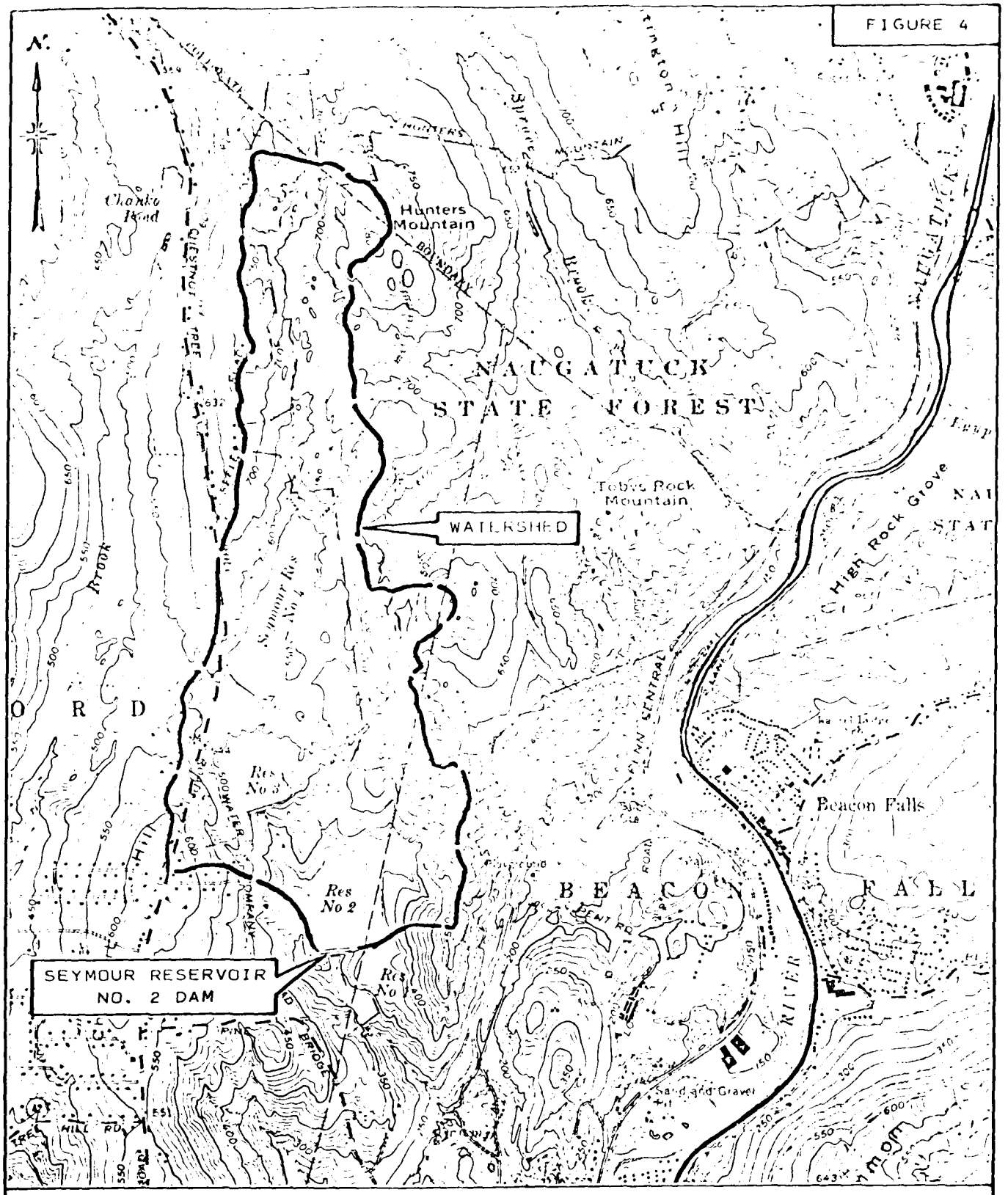
SPILLWAY DISCHARGE CHANNEL
LOOKING DOWNSTREAM

U.S.ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	SEYMOUR [illegible] NO. 2 DAM [illegible] [illegible], CONNECTICUT CT [illegible] [illegible]
ROALD HAESTAD, INC. CONSULTING ENGINEERS [illegible], CONNECTICUT		

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

FIGURE 4



WATERSHED MAP

SEYMOUR RESERVOIR NO. 2 DAM
OXFORD, CONNECTICUT

SCALE: 1" = 2000'

ROALD HAESTAD, INC.

NAUGATUCK QUADRANGLE 1972

BY DLS DATE 1/2/80 **ROALD HAESTAD, INC.** SHEET NO 1 OF 25

CONSULTING ENGINEERS

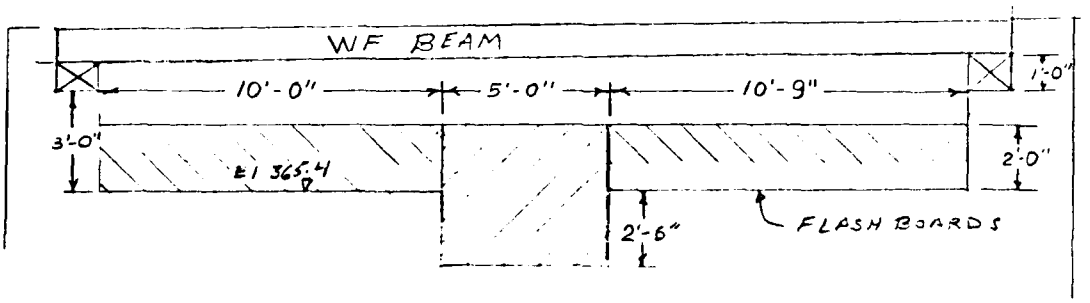
CKD BY SL DATE 1/14/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 642-05

SUBJECT SEYMOUR NO. 2 - SPILLWAY CAPACITY

SPILLWAY ELEV. = 365.4

LENGTH = 25.75'

Coef. @ Spillway = 2.8
Coef. @ Crest = 2.7
Coef. @ Flashboards = 3.3



FREEBOARD = 1.1 FEET (To low point on embankment crest with flashboards)

SPILLWAY CAPACITY W/Flashboards = $CLH^{3/2}$ = $3.3(25.75)(1.1)^{3/2}$

= 98 cfs AT TOP OF DAM

SAY 100 cfs

SPILLWAY CAPACITY W/o Flashboards = $CLH^{3/2}$ = $2.8(50)(5.6)^{3/2} + 2.8(20.75)(3.1)^{3/2}$

= 503 cfs AT TOP OF DAM

SAY 500 cfs

AVERAGE ELEV. TOP OF DAM = 369 (LOW POINT 368.5)
LENGTH OF DAM CREST @ EL 369 = 1550' Not Incl Spillway
ASSUME BRIDGE LOST IN FLOOD

BY DLS DATE 1/10/80 **ROALD HAESTAD, INC.** SHEET NO 2 OF 25

CONSULTING ENGINEERS

CKD BY SL DATE 1/14/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-08

SUBJECT SEYMOUR NO. 2 - SPILLWAY CAPACITY W/O Flashboards

	DEPTH OF FLOW (Ft.)	WEIRBOARD SLOT	MAIN SPILLWAY	OVER DAM CREST	TOTAL FLOW (cfs)
	1	14	0	0	14
	2	40	0	0	40
365.4	2.5	55	0	0	55
	3	73	21	0	94
	4	112	107	0	219
	5	157	230	0	387
369.0	6.1	211	397	0	608
	7	259	555	3573	4387
	8	317	749	10,960	12,026
	10	443	1193	32,232	33,868
	12	582	1701	59,975	62,258
	14	733	2266	92,926	95,925

BY DLS DATE 1/10/80 **ROALD HAESTAD, INC.** SHEET NO 3 OF 25

CONSULTING ENGINEERS

CKD BY SL DATE 1/14/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-08

SUBJECT SEYMOUR NO. 2 SPILLWAY CAPACITY WITH FLASH BOARDS

ELEV.	DEPTH OF FLOW (Ft.)	SPILLWAY	DAM CREST	TOTAL (cfs)
367.9	0.5	30	0	30
	1.0	85	0	85
369.0	1.6	172	0	172
	2	240	1059	1299
	3	442	6932	7374
	4	680	15,560	16,240
	5	950	26,237	27,187
	6	1249	38,626	39,875
	7	1574	52,515	54,089
	8	1923	67,759	69,682
	9	2294	84,245	86,539
	10	2687	101,886	104,573

BY DLS DATE 1/10/80

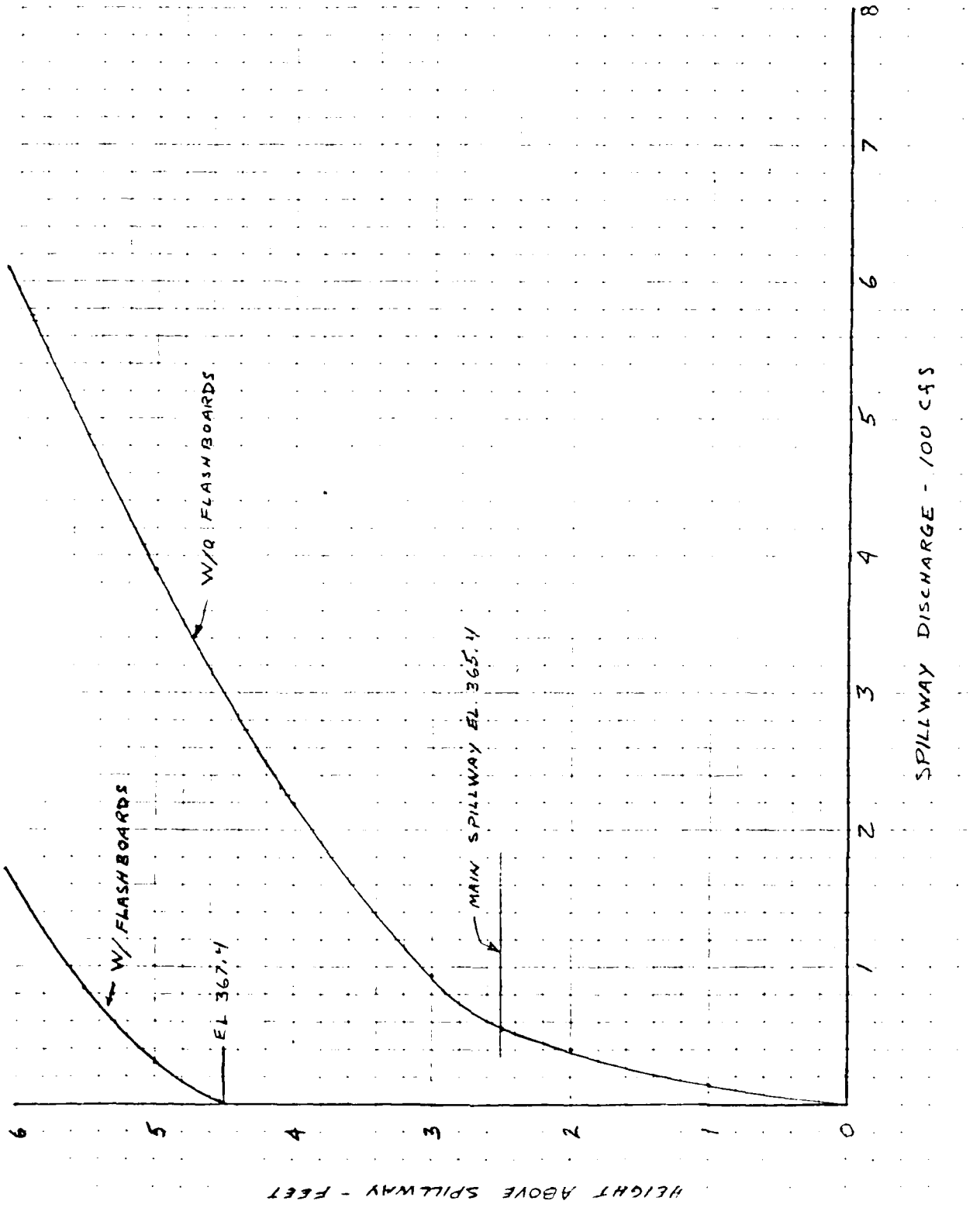
ROALD HAESTAD, INC.
CONSULTING ENGINEERS
37 Brookside Road - Waterbury, Conn. 06708

SHEET NO 4 OF 25

CKD BY SL DATE 1/14/80

JOB NO 049-0

SUBJECT SEYMOUR NO. 2 - SPILLWAY CAPACITY



BY DLS DATE 1/9/80 **ROALD HAESTAD, INC.** SHEET NO 5 OF 25

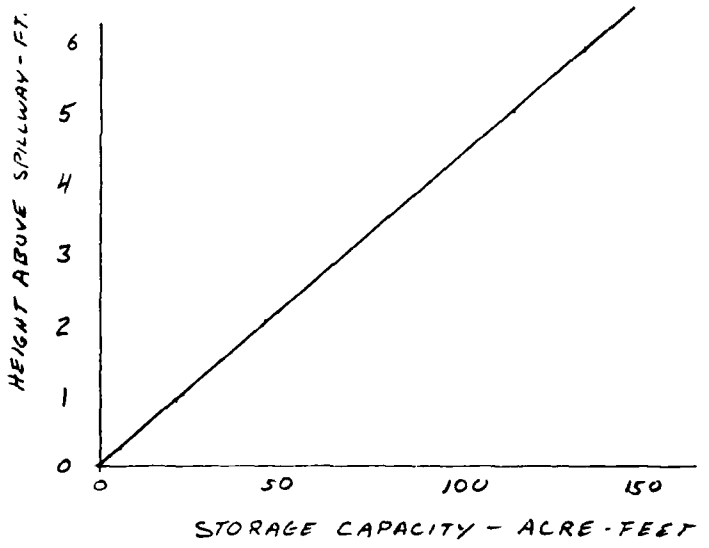
CONSULTING ENGINEERS

CKD BY SL DATE 1/14/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-08

SUBJECT SEYMOUR NO. 2 — STORAGE - CAPACITY

WATER SURFACE AREA ASSUMED CONSTANT AT 23.0 ACRES. DEPTH OF SURCHARGE STORAGE IS EXPECTED TO BE SMALL.

HEIGHT ABOVE SPILLWAY - FEET	STORAGE CAPACITY ACRE - FEET
1	23
2	46
3	69
4	92
5	115



BY DAS DATE 1/23/80 **ROALD HAESTAD, INC.** SHEET NO 6 OF 25

CONSULTING ENGINEERS

CKD BY SH DATE 1/29/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-08

SUBJECT SEYMOUR NO. 2 DAM - TEST FLOOD - ½ PMF

THE TEST FLOOD ROUTING FOR SEYMOUR NO. 2 WAS DEVELOPED BY CALCULATING AN INFLOW HYDROGRAPH FOR SEYMOUR NO. 4, ROUTING THE FLOOD THROUGH THE RESERVOIR AND ADDING THE OUTFLOW TO THE INFLOW OF THE SEYMOUR NO. 3 RESERVOIR. THE FLOOD WAS THEN ROUTED THROUGH SEYMOUR NO. 3 RESERVOIR AND THE OUTFLOW ADDED TO THE INFLOW FOR THE SEYMOUR NO. 2 RESERVOIR.

ROUTING THE TOTAL INFLOW HYDROGRAPH THROUGH THE SEYMOUR NO. 2 RESERVOIR DETERMINS THE ADEQUACY OF THE SPILLWAY.

PEAK OUTFLOW WAS 550 CFS

SPILLWAY CAPACITY WITHOUT FLASHBOARDS = 500 CFS

OR $\frac{500}{550} \times 100 = 91\%$ OF THE TEST FLOOD

SPILLWAY CAPACITY WITH FLASHBOARDS = 100 CFS

OR $\frac{100}{550} \times 100 = 18\%$ OF THE TEST FLOOD

BY DLS DATE 1/8/80 **ROALD HAESTAD, INC.** SHEET NO 7 OF 25

CONSULTING ENGINEERS

CKD BY SH DATE 1/15/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 042-12

SUBJECT SEYMOUR RES. NO.4 DAM - TEST FLOOD - ½ PMF

TEST FLOOD = ½ PMF

DRAINAGE AREA = 343 ACRES = 0.54 Sq. Mi.

FROM CORPS OF ENG. CHART FOR "ROLLING" TERRAIN

MPF = 2,125 cfs / Sq. Mi (2.0 Sq. Mi. MINIMUM)

PMF = 2,125 x 0.54 sq. mi. = 1148 CFS

½ PMF = ½ (1148) = 574 CFS

USE VOLUME OF RUNOFF = 9.5" = 274 Ac-Ft.

FROM DESIGN OF SMALL DAMS

$$q_p = \frac{484 A Q}{T_p} \qquad T_b = 2.67 T_p$$

q_p = PEAK RATE OF RUNOFF - CFS

A = DRAINAGE AREA - Sq. Mi.

Q = TOTAL RUNOFF IN INCHES

T_p = TIME IN HOURS FROM START OF RISE TO PEAK

T_b = TIME BASE OF HYDROGRAPH IN HOURS

$$574 = \frac{484 (0.54)(9.5)}{T_p}$$

T_p = 4.3 HOURS

T_b = 2.67 (4.3) = 11.5 HOURS

BY DLS DATE 1/8/80

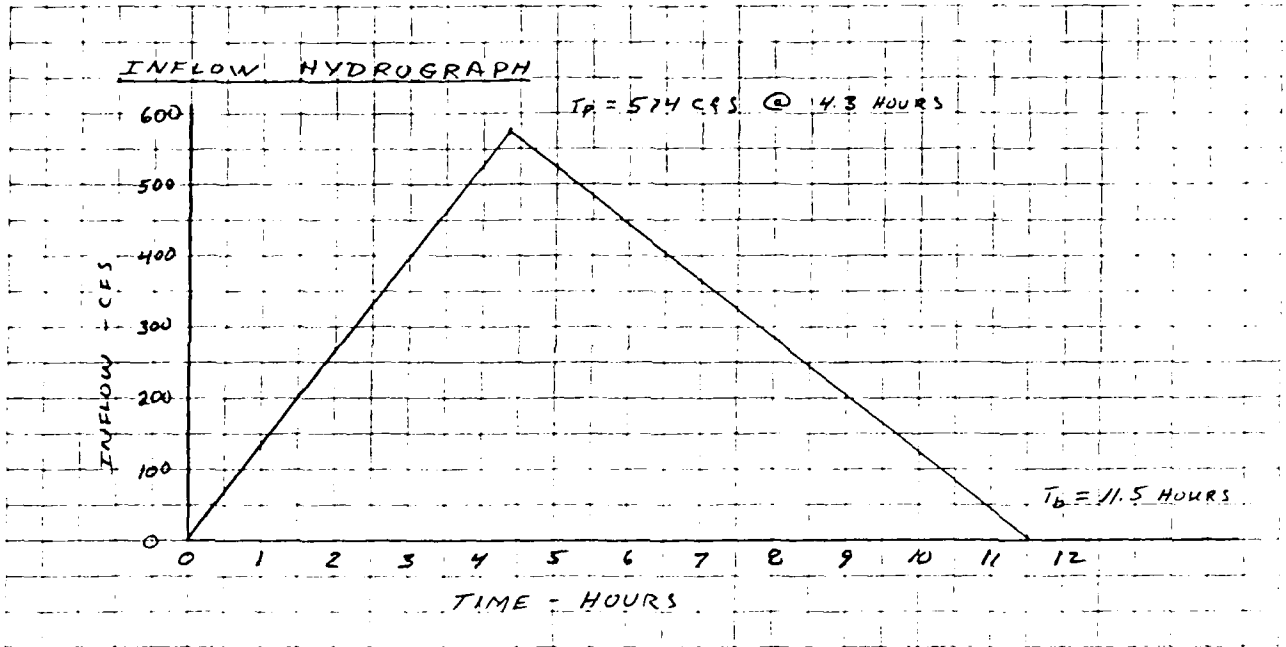
ROALD HAESTAD, INC.
CONSULTING ENGINEERS
37 Brookside Road - Waterbury, Conn. 06708

SHEET NO 8 OF 25

CKD BY SH DATE 1/14/80

JOB NO 049-12

SUBJECT SEYMOUR NO. 4 - TEST FLOOD - 1/2 PMF



BY S.L. DATE 1/9/80 ROALD HAESTAD, INC. CONSULTING ENGINEERS SHEET NO. 9 OF 25

CHKD. BY D.L.S. DATE 1/11/80 JOB NO. 049-12

SUBJECT S.E. YMOUR NO. 4 - Flood Routing

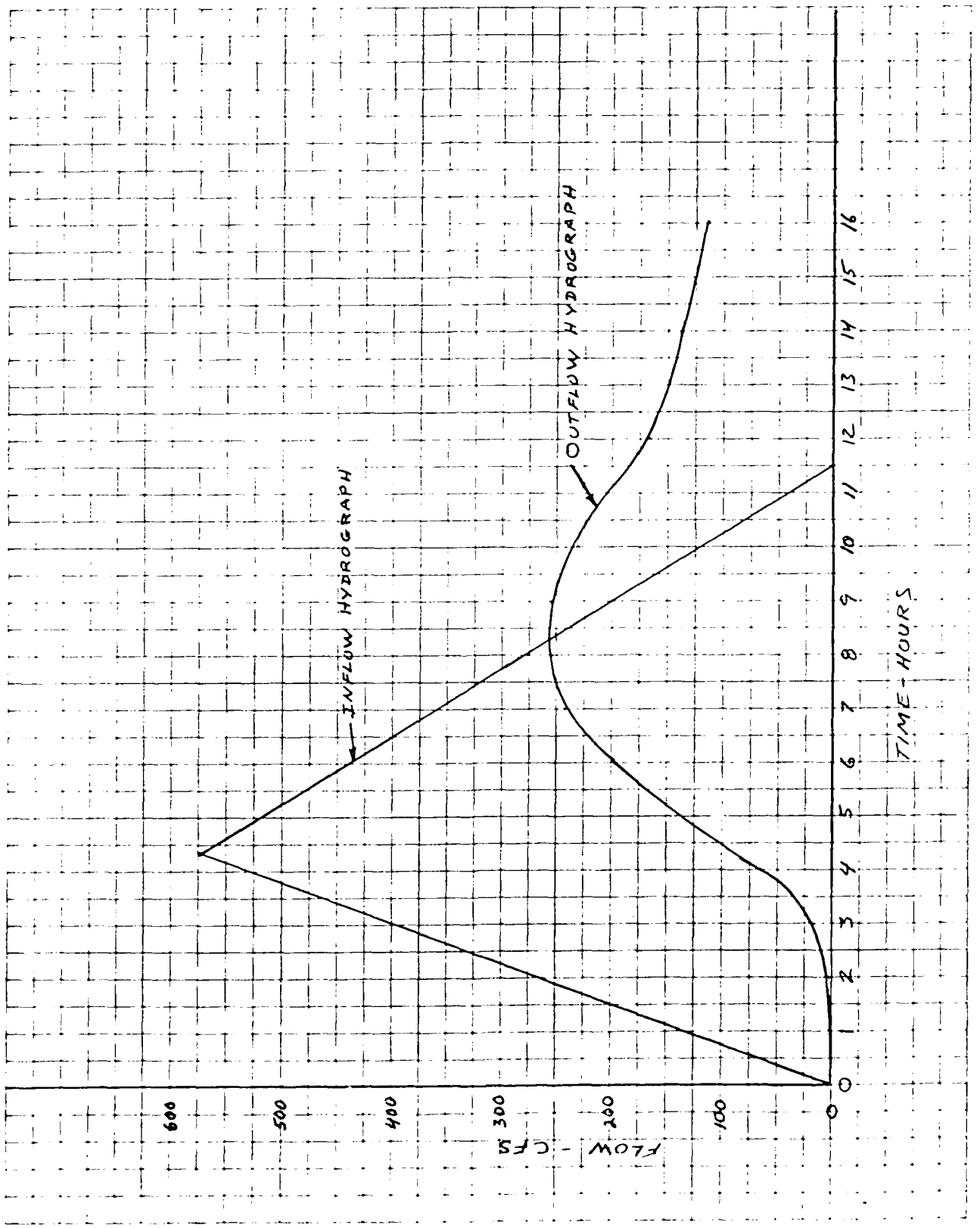
TIME HOURS	ΔT HOURS	AVERAGE RATE OF INFLOW Q_i Δt	AVERAGE RATE OF INFLOW Q_i CFS	AVERAGE INFLOW ACRE-FEET	TRIAL RES. STORAGE EL. END OF Δt	AVERAGE RATE OF OUTFLOW Q_o CFS	AVERAGE OUTFLOW FOR Δt ACRE-FEET	INCREMENTAL STORAGE, ΔS ACRE-FEET	TOTAL STORAGE ACRE-FEET	RESERVOIR ELEVATION END OF Δt
0			0			0			0	
	1	65		5.4	~~5322~~	1	0	5.4	5.4	~~5321~~
1					5321	1	0	5.4	5.4	5321
	1	200		16.5	5325	3	0	16.5	21.9	5325
2										
	1	335		27.7	~~5330~~	7	1	26.7	48.6	~~5332~~
3					5332	9	1	26.7	48.6	5332
	1	463		38.3	~~5335~~	21	2	36.3	84.9	~~5340~~
4					5340	38	3	35.3	83.9	5340
	1	540		44.6	~~5350~~	109	9	35.6	119.5	~~5349~~
5					5349	104	9	35.6	119.5	5349
	1	485		40.1	~~5360~~	205	17	23.1	142.6	~~5354~~
6					5354	170	14	26.1	145.6	5354
	1	405		33.5	~~5355~~	201	17	16.5	160.1	~~5358~~
7					5358	218	18	15.5	159.1	5358
	1	320		26.4	~~5357~~	235	20	6.4	165.5	~~5359~~
8					5359	247	21	5.4	164.5	5359
	1	240		19.8	~~5358~~	247	21	1.2	163.3	~~5359~~
9					5359	253	21	-1.2	163.3	5359
	1	160		13.2	~~5358~~	247	21	7.8	155.5	~~5357~~
10					5357	242	20	-6.8	156.5	5357
	1	85		7.0	~~5356~~	224	19	-12.0	144.5	~~5355~~
11					5355	219	18	+11.0	145.5	5355
	1	12		1.0	~~5350~~	181	15	-14.0	131.5	~~5351~~
12					5351	186	16	-15.0	130.5	5351
	2	0		0	~~5349~~	155	13	-13.0	117.5	~~5348~~
14					5348	149	12	-12.0	118.5	5348
	2	0		0	~~5345~~	119	10	-10.0	108.5	~~5346~~
16					5346	124	10	-10.0	108.5	5346

BY DLS DATE 1/10/80 **ROALD HAESTAD, INC.** SHEET NO 10 OF 25

CONSULTING ENGINEERS

CKD BY SL DATE 1/11/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 045-12

SUBJECT SEYMOUR NO. 4 - FLOOD ROUTING



BY RAS DATE 1/7/80 **ROALD HAESTAD, INC.** SHEET NO 11 OF 25

CONSULTING ENGINEERS

CKD BY SH DATE 1/15/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-07

SUBJECT SEYMOUR NO. 3 - TEST FLOOD ½ PMF

DRAINAGE AREA = 432 ACRES = 0.68 sq. mi.
= 0.54 (SEYMOUR NO. 4) + 0.14 (SEYMOUR No. 3)

FROM CORPS OF ENGINEERS CHART "ROLLING" TERRAIN

MPF = 2125 cfs/sq. mi. (2.0 sq. mi. minimum)

PMF = 2125 x 0.14 sq. mi. = 298 cfs

½ PMF = ½ x 298 = 149 cfs

USE DEPTH OF RUNOFF = 19"/2 = 9.5"

VOLUME OF RUNOFF = 0.14 sq. mi x 640 Ac/sq. mi. x 9.5"/12"/ft.

V = 71 Ac-Ft.

FROM DESIGN OF SMALL DAMS

$$q_p = \frac{484AQ}{T_p} \qquad T_b = 2.67\,T_p$$

q_p = PEAK RATE OF RUNOFF - CFS
A = DRAINAGE AREA - Sq. mi.
Q = TOTAL RUNOFF - INCHES
T_p = TIME IN HOURS FROM START OF RISE TO PEAK
T_b = TIME BASE OF HYDROGRAPH IN HOURS

$$149 = \frac{484(0.14)(9.5)}{T_p}$$

T_p = 4.3 HOURS

T_b = 2.67 (4.3) = 11.5 HOURS

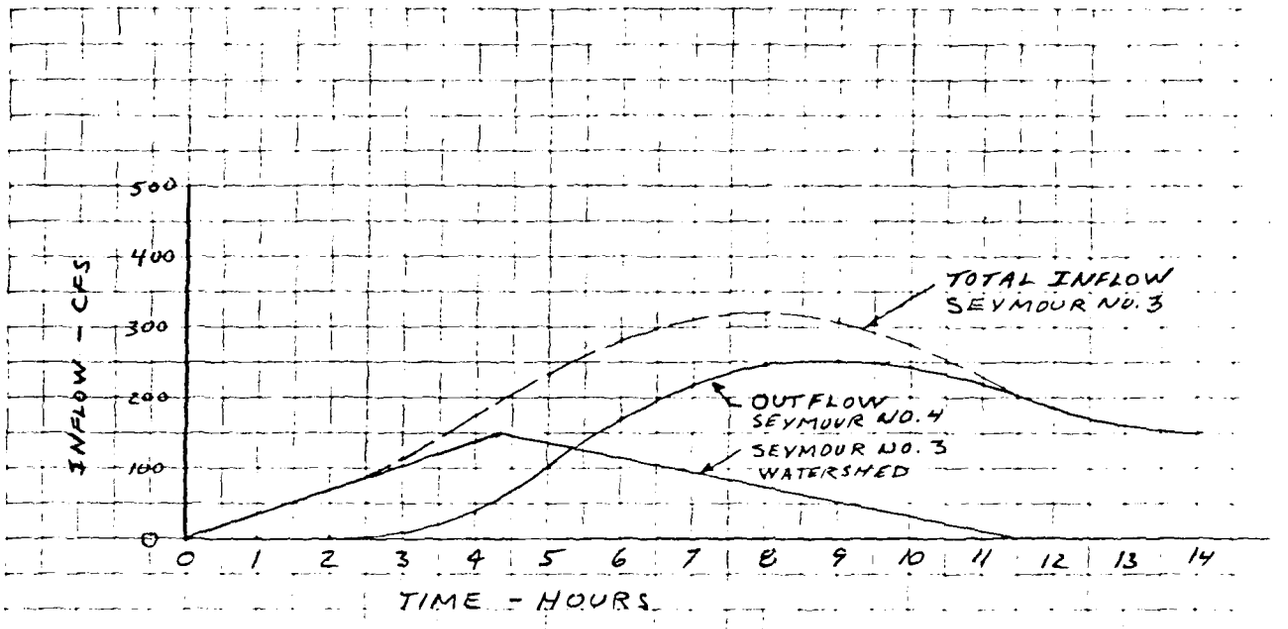
THE ABOVE HYDROGRAPH IS FOR SEYMOUR NO. 3 WATERSHED. ROUTED OUTFLOW FROM SEYMOUR NO. 4 MUST BE ADDED TO GET TOTAL INFLOW.

BY D.L.S. DATE 1/9/80. **ROALD HAESTAD, INC.** SHEET NO 12 OF 25

CONSULTING ENGINEERS

CKD BY S.L. DATE 1/15/80. 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-07

SUBJECT SEYMOUR NO. 3 TEST FLOOD ½ PMF



BY SL DATE 1/10/80 ROALD HAESTAD, INC. SHEET NO. 13 OF 25
CONSULTING ENGINEERS
CHKD. BY DLS DATE 1/21/80 JOB NO. 049-07
SUBJECT SEYMOUR NO. 3 - Flood Routing With Flash boards
1/2 PMF

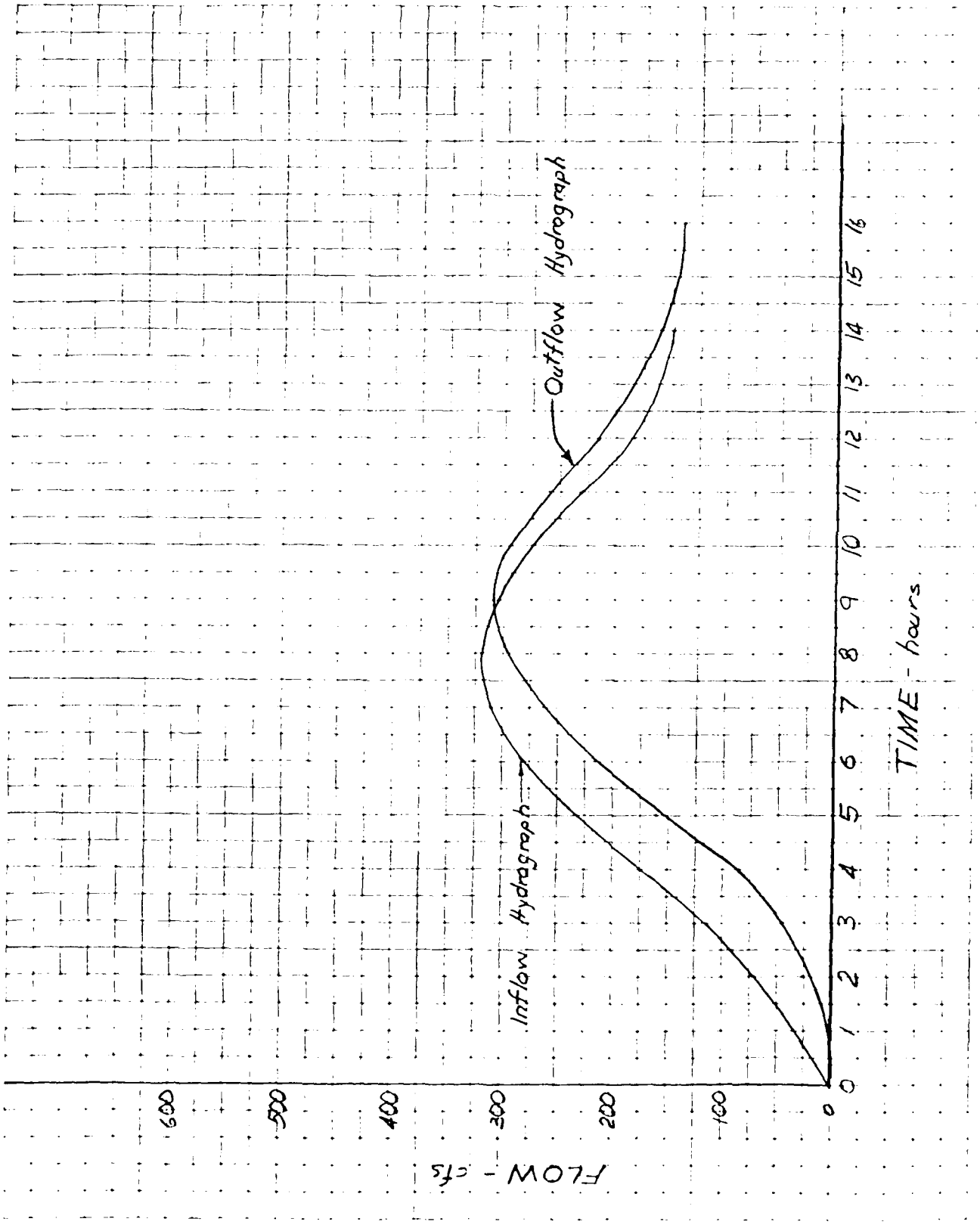
TIME HOURS	ΔT HOURS	AVERAGE RATE OF INFLOW Qi Δt	SEC.FT.	AVERAGE INFLOW ACRE-FEET	TRIAL RES. STORAGE EL. END OF Δt	AVERAGE RATE OF OUTFLOW Qo	SEC.FT.	AVERAGE OUTFLOW FOR Δt ACRE-FEET	INCREMENTAL STORAGE, ΔS ACRE-FEET	TOTAL STORAGE ACRE-FEET	RESERVOIR ELEVATION END OF Δt
0			0				0			0	
1	1	18		1.5	~~4533~~ 4530	20	10	1	05	0.5	4530
					4530	0	0	0	1.5	1.5	4531
2	1	53		4.4	4534	26	13	1	3.4	4.9	4534
3	1	93		7.8	4537	45	35	3	4.8	9.7	4537
4	1	145		12.0	4542	85	65	5	7.0	16.7	4542
5	1	205		17.0	4548	62	123	10	7.0	23.7	4548
6	1	258		21.5	4552	215	188	16	5.5	29.2	4552
7	1	295		24.6	4555	210	238	20	4.6	33.8	4555
8	1	315		26.3	4557	215	278	23	3.3	37.1	4557
9	1	313		26.1	4558	310	303	25	1.1	38.2	4558
10	1	288		24.0	4557	305	303	25	-1.0	37.2	4557
11	1	250		20.8	4556	275	285	24	-3.2	34.0	4555
12	1	186		15.5	4552	215	245	20	-4.5	29.5	4552
14	2	149		12.4	4548	160	188	16	-3.6	25.9	4549
16	2	124		10.3	4547	135	150	13	-2.7	23.2	4547

BY SL DATE 1/14/80 **ROALD HAESTAD, INC.** SHEET NO 14 OF 25

CONSULTING ENGINEERS

CKD BY RLS DATE 1/21/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-07

SUBJECT SEYMOUR NO. 3 - Flood Routing - 1/2 PMF



WATERSHED AREA - SEYMOUR NO. 2 ONLY = 0.48 sq. mi.

TOTAL WATERSHED = 1.15 sq. mi.

FROM CORPS OF ENGINEERS CHART FOR "ROLLING" TERRAIN

MPF = 2125 CFS/sq. mi. (Chart Minimum 2.0 sq. mi)

PMF = 2125 x 0.48 sq. mi. = 1020 CFS

½ PMF = ½ (1020) = 510 CFS

USE DEPTH OF RUNOFF = 19"/2 = 9.5"

Volume of Runoff = 0.48 sq. mi. (640 Ac/sq. mi.) x 9.5"/12"/ft.

Vol. = 243 Ac-Ft.

FROM DESIGN OF SMALL DAMS

$$q_p = \frac{484 A Q}{T_p} \qquad T_b = 2.67 T_p$$

q_p = PEAK RATE OF RUNOFF - CFS
A = DRAINAGE AREA - SQ-MI
Q = TOTAL RUNOFF - INCHES
T_p = TIME IN HOURS FROM START OF RISE TO PEAK
T_b = TIME BASE OF HYDROGRAPH IN HOURS

$$510 = \frac{484 (0.48)(9.5)}{T_p}$$

$T_p = 4.3$ HOURS

$T_b = 2.67 (4.3) = 11.5$ HOURS

THE ABOVE HYDROGRAPH IS FOR THE SEYMOUR NO. 2 WATERSHED. ROUTED OUTFLOW FROM SEYMOUR NO. 3 MUST BE ADDED TO GET TOTAL INFLOW.

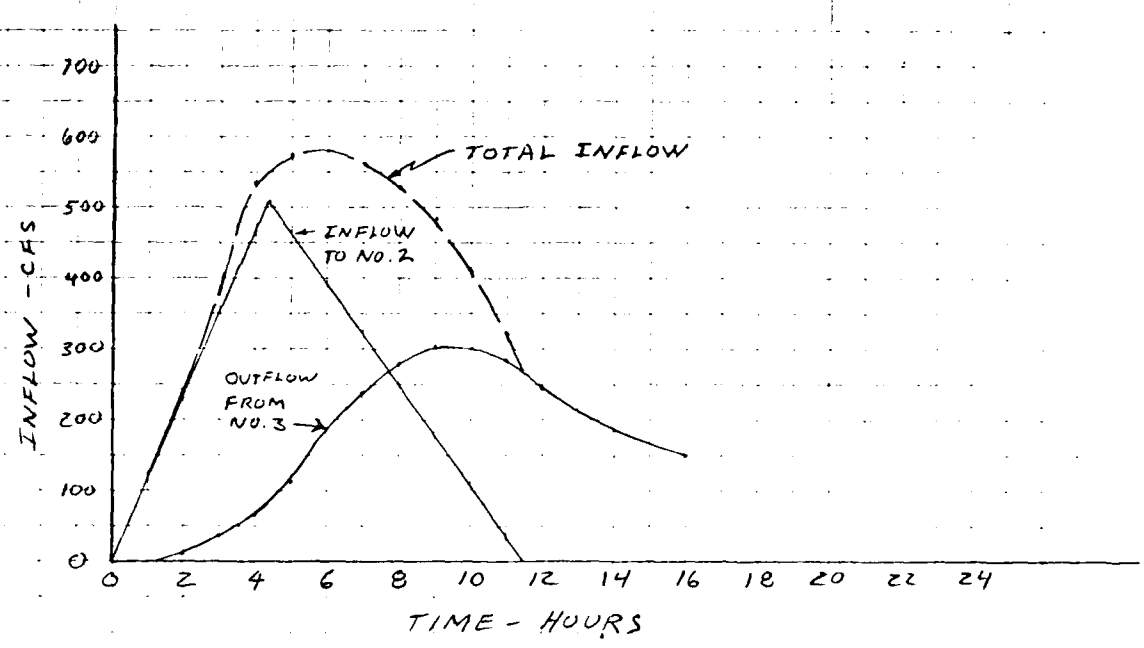
BY DLS DATE 1/8/80 **ROALD HAESTAD, INC.** SHEET NO 16 OF 25

CONSULTING ENGINEERS

CKD BY SL DATE 1/15/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-08

SUBJECT SEYMOUR NO. 2 - TEST FLOOD ½ PMF

INFLOW - HYDROGRAPH



BY SL DATE 4/10/80 ROALD HAESTAD, INC. SHEET NO 17 OF 25
CONSULTING ENGINEERS
CHKD BY DLS DATE 11/21/80 JOB NO 049-02
SUBJECT SEYMOUR NO 2 - Flood Routing W/o Flashboards

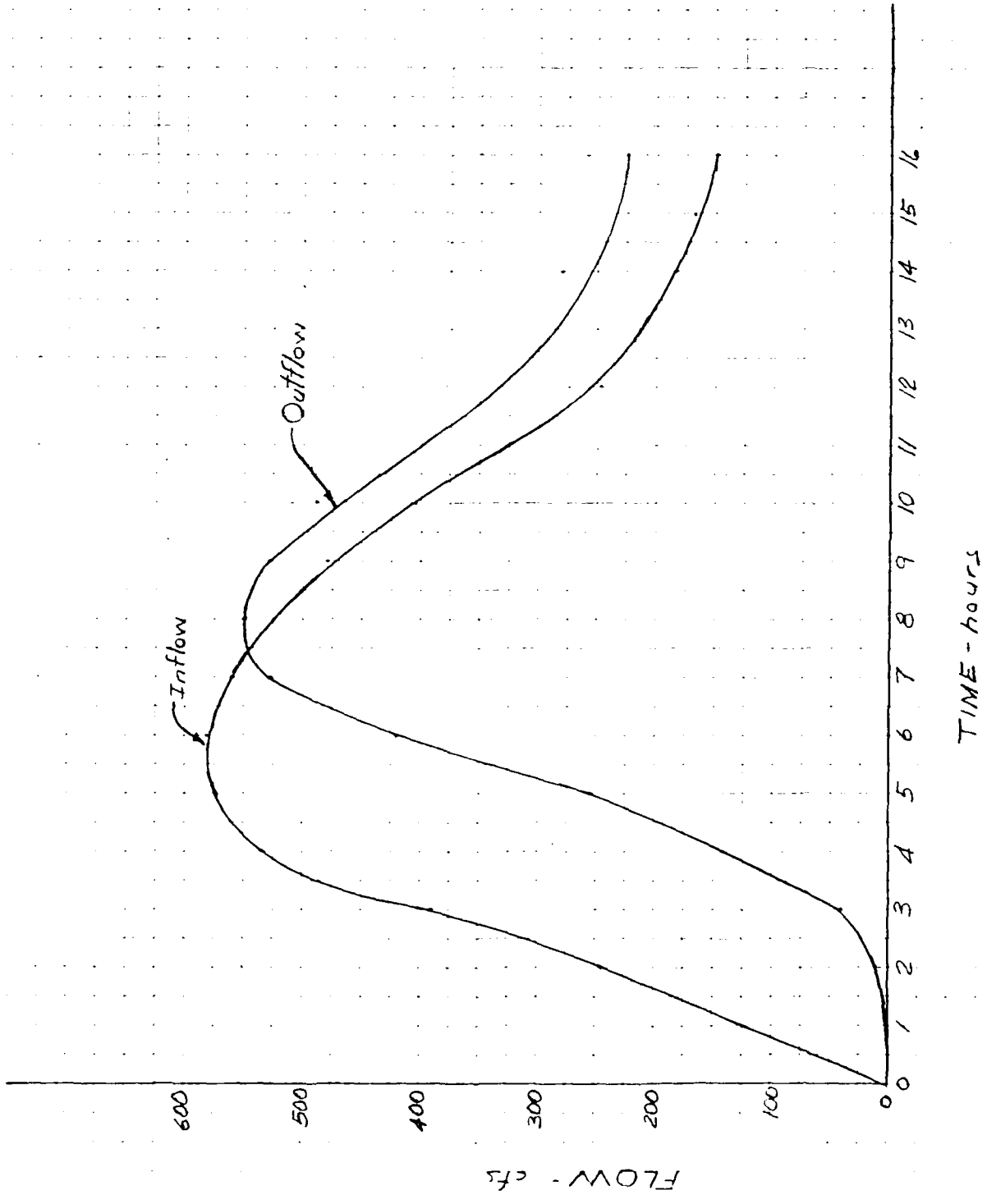
TIME HOURS	ΔT HOURS	AVERAGE RATE OF INFLOW Q_i Δt SEC FT.	AVERAGE INFLOW ACRE-FEET	TRIAL RES. STORAGE EL. END OF Δt	AVERAGE RATE OF OUTFLOW Q_o SEC FT.	AVERAGE OUTFLOW FOR Δt ACRE-FEET	INCREMENTAL STORAGE, ΔS ACRE-FEET	TOTAL STORAGE ACRE-FEET	RESERVOIR ELEVATION END OF Δt
0		0			0			0	
1	1	63	5.3	3631	1	0	5.3	5.3	3631
2	1	188	15.7	3638	7	1	14.7	20.0	3638
3	1	325	27.1	3650	26	2	25.1	45.1	3649
4	1	468	39.0	~~3659~~	~~67~~	6	33.0	78.1	3663
				3663	90	8	31.0	76.1	3663
5	1	555	46.3	~~3669~~	~~180~~	15	31.3	~~1074~~	~~3675~~
				3675	227	19	27.3	1034	3674
6	1	575	47.9	~~3684~~	~~401~~	33	14.9	~~1183~~	~~3681~~
				3681	361	30	17.9	121.3	3682
7	1	568	47.3	~~3688~~	~~489~~	41	6.3	~~1276~~	~~3685~~
				3685	459	38	9.3	130.6	3686
8	1	545	45.4	~~3688~~	~~540~~	45	0.4	~~1310~~	~~3686~~
				3686	519	43	2.4	1330	3687
9	1	505	42.1	3687	539	45	-2.9	1301	3686
10	1	445	37.1	~~3685~~	~~530~~	44	-6.9	~~1232~~	~~3683~~
				3683	510	43	-5.9	1242	3684
11	1	368	30.7	3681	439	37	-7.7	1165	3680
12	1	285	23.8	~~3675~~	~~361~~	30	-6.2	~~1103~~	~~3677~~
				3677	379	32	-8.2	1083	3676
13	2	213	18.1	~~3675~~	~~332~~	28	-9.9	~~984~~	~~3672~~
				3672	309	26	-7.9	1004	3673
14	2	169	14.1	3669	244	20	-5.9	945	3671
15				3671	258	22	-7.9	925	3670

BY SL DATE 1/14/80 **ROALD HAESTAD, INC.** SHEET NO 18 OF 25

CONSULTING ENGINEERS

CKD BY DLS DATE 1/21/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-08

SUBJECT SEYMOUR NO. 2 - Flood Routing



SUBJECT SEYMOUR NO. 2 - Estimating Downstream Dam Failure Hydrographs

S = Reservoir Storage at time of failure = Storage at Spillway Level + Freeboard Storage

$$S = \left[169{,}552{,}200 \text{ gal} \times \frac{1 \text{ acre-ft}}{325{,}851 \text{ gal}}\right] + \left[23 \text{ acres} \times 3.1 \text{ ft}\right]$$

$S = 520.34$ acre-ft + 71.3 acre-ft

$S = 591.6$ acre-ft use 590 acre-ft

Q_{p1} = Peak Failure Outflow = $\frac{8}{27} W_b \sqrt{g}\, Y_o^{3/2}$

W_b = Breach Width - 40% of dam length at mid height = (0.4)(285) = 114 ft

Y_o = Total height from river bed to pool level at failure = 31 feet

$Q_{p1} = \frac{8}{27}(114)\sqrt{32.2}\,(31)^{3/2} = 33{,}083$ cfs

SECTION No. 1 - SEYMOUR DAM NO. 1

$V_1 = 127$ acre-ft $H_1 = 12.7$ ft.

V_1 is less than 1/2 of S ∴ reach is ok.

$Q_{p2}(TRIAL) = Q_{p1}(1 - V_1/S)$

$Q_{p2}(TRIAL) = 33{,}083 \text{ cfs}\,(1 - 127/590)$

$Q_{p2}(TRIAL) = 25{,}962$ cfs

$H_2 = 11.2$ ft

$V_2 = 107$ acre-ft

$V_{ave} = \frac{V_1 + V_2}{2} = \frac{107 + 127}{2} = 117$ acre-ft

$Q_{p2} = 33{,}083\left(1 - \frac{117}{590}\right) = 26{,}522$ cfs $H_2 = 11.4$ ft.

OVERTOPS SEYMOUR NO.1 DAM BY 9.4 ft.

SECTION NO 2 : Reach length = 1,050 ft

Q_{P2} = 26,522 cfs

H_2 = 14.5 ft $(Area)_4$ = 1,380 sq ft

$V_2 = (Area)_2 \times Length$

$$V_2 = \left[1{,}380\ ft^2 \times 1{,}050\ ft\right] \times \frac{1\ acre\text{-}ft}{43{,}560\ ft^3} = 33.3 \text{ use } 33\ acre\text{-}ft$$

V_2 is less than 1/2 of S ∴ reach is ok

$Q_{P3}(TRIAL) = Q_{P2}(1 - V_2/S)$

$Q_{P3}(TRIAL) = 26{,}522 cfs\ (1 - 33/590)$

$Q_{P3}(TRIAL) = 25{,}038$ cfs

H_3 = 14.0 ft $(Area)_3$ = 1,310 sq ft

$V_3 = (Area)_3 \times Length$

$$V_3 = \left[1{,}310\ ft^2 \times 1{,}050\ ft\right] \times \frac{1\ acre\text{-}ft}{43{,}560\ ft^3} = 31.6 \text{ use } 32\ acre\text{-}ft$$

$$V_{ave} = \frac{V_3 + V_2}{2} = \frac{32 + 33}{2} = 32.5\ acre\text{-}ft$$

$Q_{P3} = Q_{P2}(1 - V_{ave}/S)$

$Q_{P3} = 26{,}522 cfs\ (1 - 32.5/590)$

Q_{P3} = 25,061 cfs H_3 = 14.0 ft

SECTION NO 3 : Reach length = 2,600 ft

Q_{P3} = 25,061 cfs

H_3 = 12.7 ft $(Area)_3$ = 1,435 sq ft

AD-A144 073 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS SEYMOUR RESERVOIR DAM..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV FEB 80 2/2

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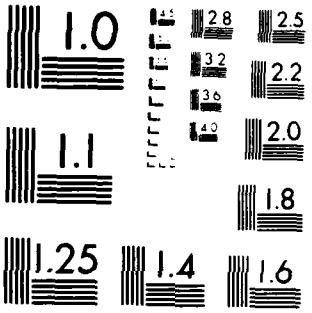


SUBJECT SEYMOUR NO. 2 - Estimating Downstream Dam Failure Hydrographs

Continued:

$V_3 = (Area)_3 \times Length$

$V_3 = \left[1,435\ ft^2 \times 2,600\ ft\right] \times \frac{1\ acre\text{-}ft}{43,560\ ft^3} = 85.6$ use 86 acre-ft

V_3 is less than 1/2 of S ∴ reach is o.k.

$Q_{P4}(TRIAL) = Q_{P3}(1 - V_3/S)$

$Q_{P4}(TRIAL) = 25,061\ cfs\ (1 - 86/590)$

$Q_{P4}(TRIAL) = 21,408\ cfs$

$H_4 = 12.0\ ft$ $\qquad (Area)_4 = 1,300$ sq ft

$V_4 = (Area)_4 \times Length$

$V_4 = \left[1,300\ ft^2 \times 2,600\ ft\right] \times \frac{1\ acre\text{-}ft}{43,560\ ft^3} = 77.6$ use 78 acre-ft

$V_{ave} = \frac{V_4 + V_3}{2} = \frac{86 + 78}{2}$ 82 acre-ft

$Q_{P4} = Q_{P3}(1 - V_{ave}/S)$

$Q_{P4} = 25,061\ cfs\ (1 - 82/590)$

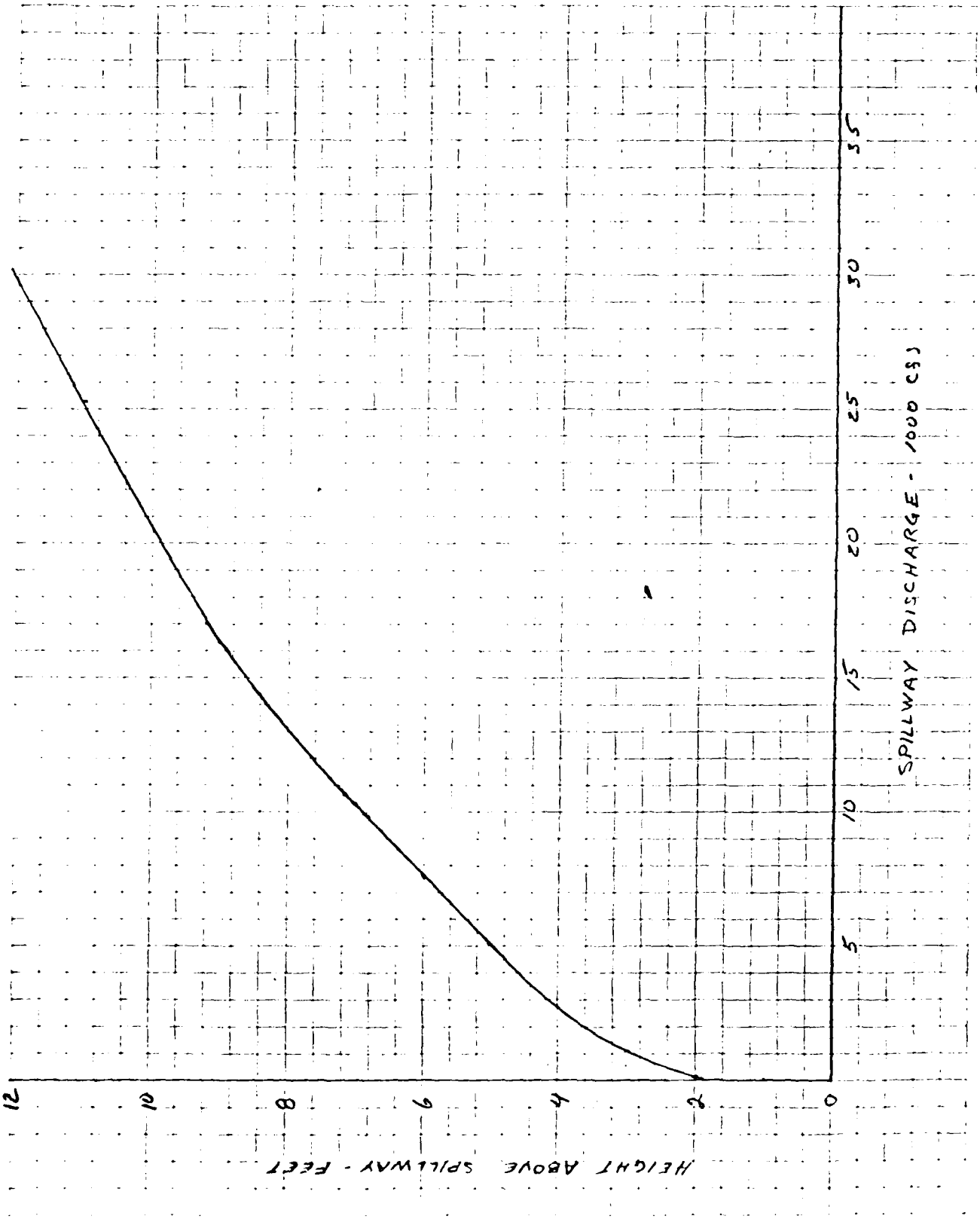
$Q_{P4} = 21,578\ cfs$ $\qquad H_4 = 12\ ft$

BY DLS DATE 1/7/80 **ROALD HAESTAD, INC.** SHEET NO 22 OF 25

CONSULTING ENGINEERS

CKD BY SL DATE 1/14/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-09

SUBJECT SEYMOUR NO. 1 SPILLWAY DISCHARGE CURVE



BY SL DATE 1/8/80

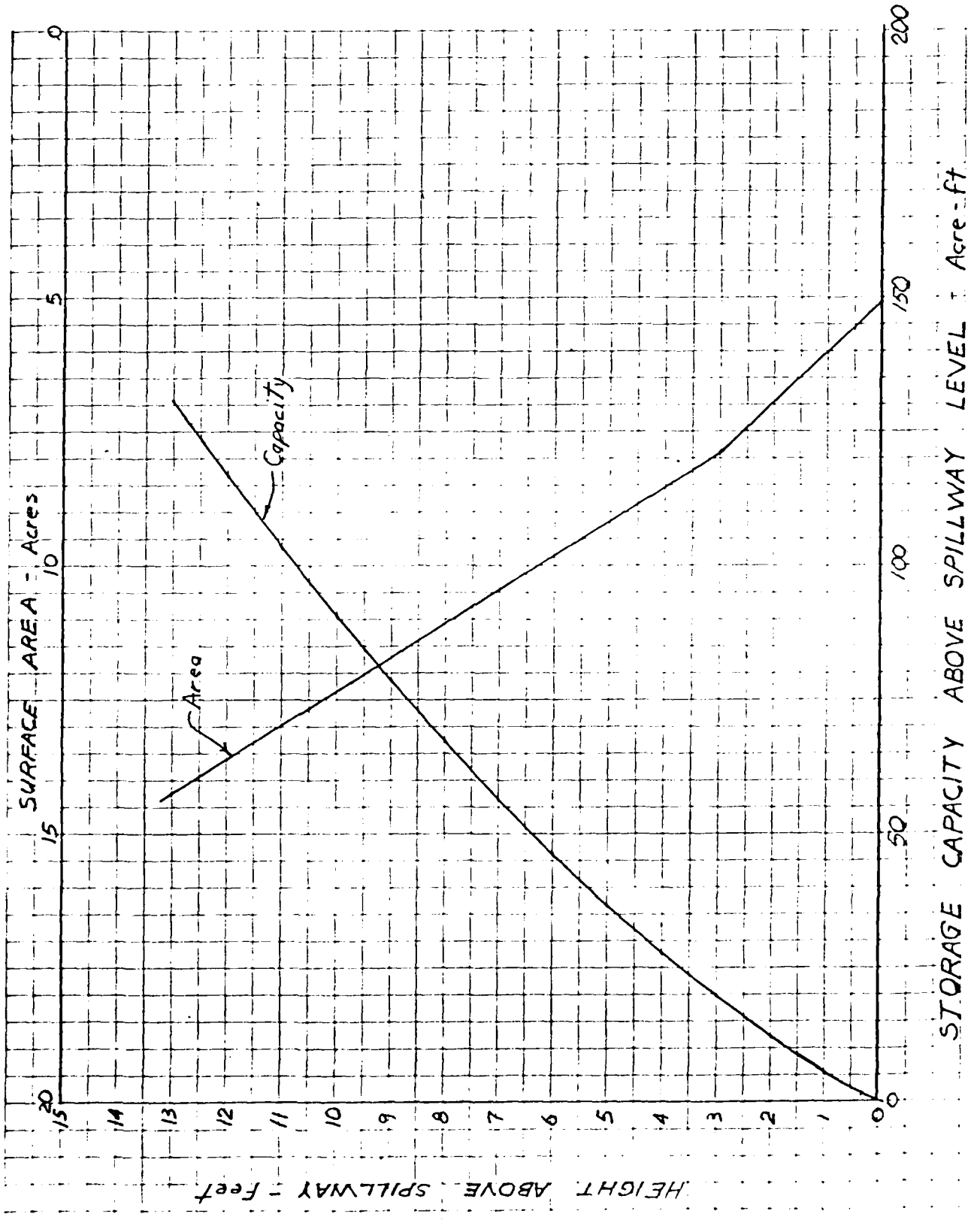
ROALD HAESTAD, INC.
CONSULTING ENGINEERS
37 Brookside Road - Waterbury, Conn. 06708

SHEET NO 23 OF 25

CKD BY DLS DATE 1/11/80

JOB NO 049-09

SUBJECT SEYMOUR NO 1 - Area - Capacity Curve



BY DLS DATE 1/10/80 **ROALD HAESTAD, INC.** SHEET NO 24 OF 25

CONSULTING ENGINEERS

CKD BY SL DATE 1/14/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-08

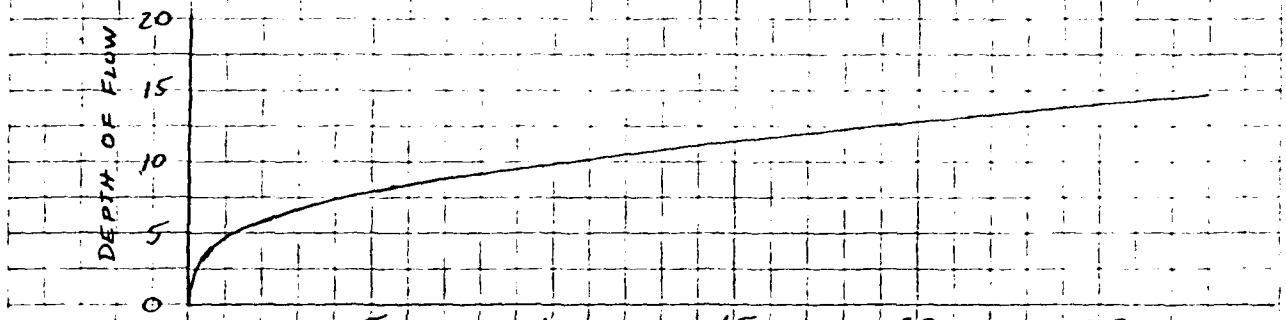
SUBJECT SEYMOUR NO 2 - FLOOD ROUTING

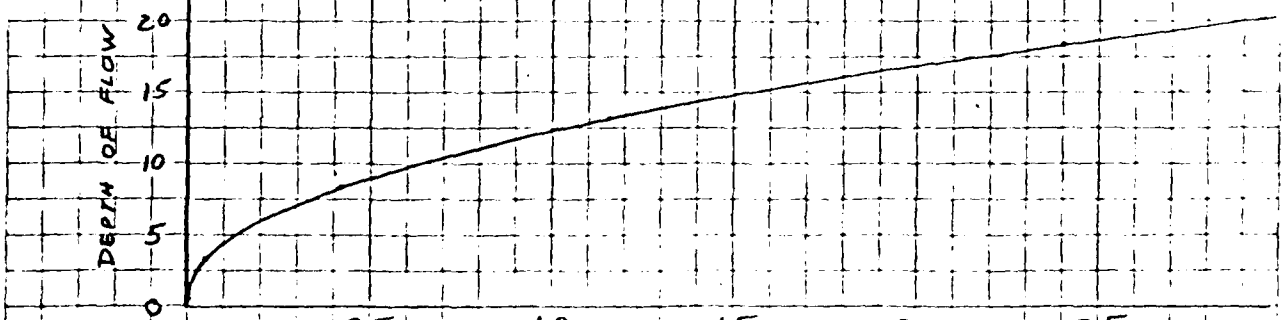
SECTION NO. 2

SCALE: 1" = 200' HOR.
1" = 50' VERT.

n = 0.04
L = 1050
S = 0.027

D	W_p	A	R	S	V	Q
3	40	53	1.33	0.027	7.4	392
8	130	416	3.20	0.027	13.3	5533
13	225	1166	5.18	0.027	18.3	21,338
18	335	2404	7.18	0.027	22.7	54,571
23	835	5529	6.62	0.027	21.5	118,874





BY SK DATE 1/11/80 **ROALD HAESTAD, INC.** SHEET NO 25 OF 25

CONSULTING ENGINEERS

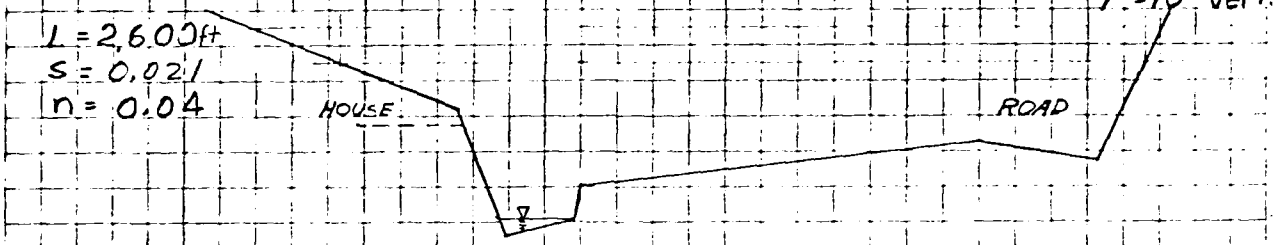
CKD BY DLS DATE 1/21/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 049-08

SUBJECT SEYMOUR NO 2 - Downstream Flood Routing

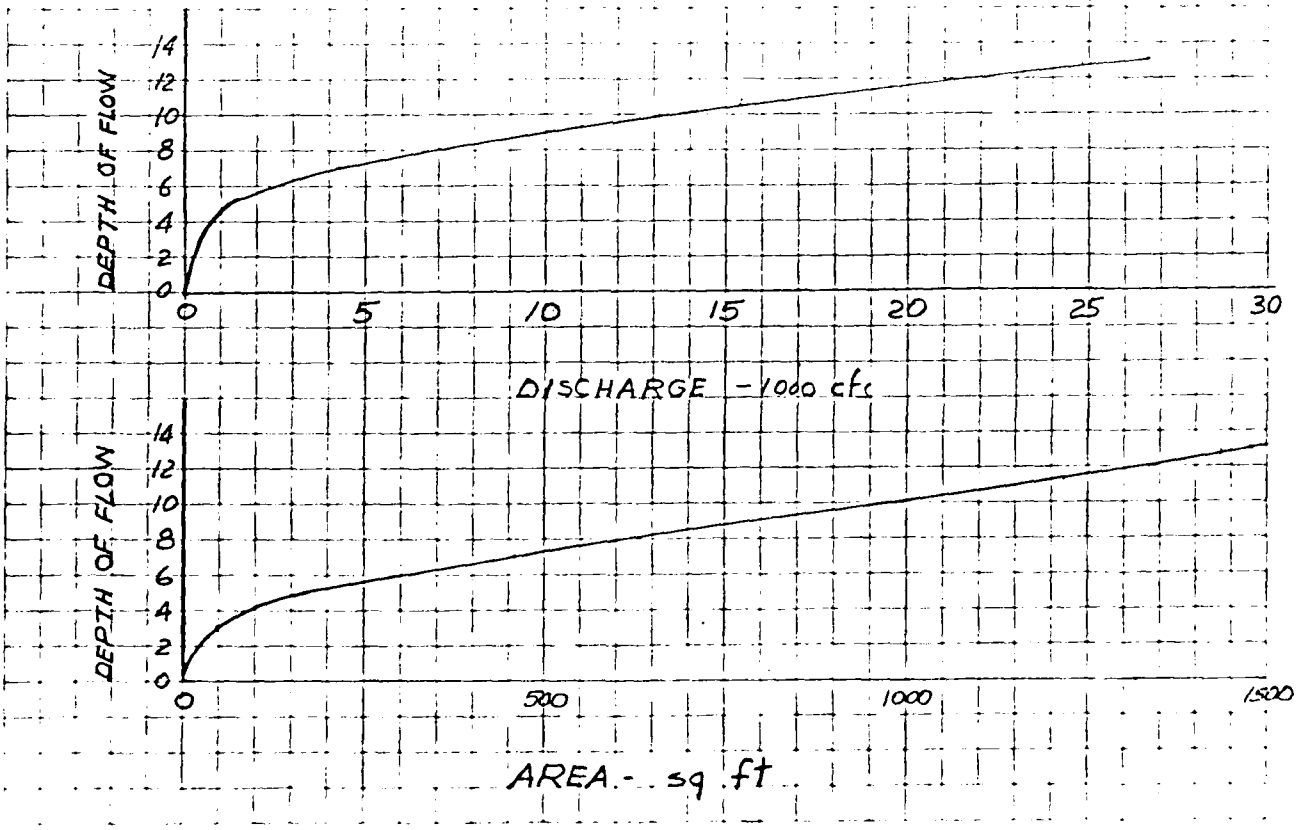
SECTION NO 3 (Field Surveyed)

Scale: 1" = 40' Horiz
1" = 10' Vert

L = 2,600 ft
S = 0.021
n = 0.04



D	W_p	A	R	S	V	Q
1	18	9	0.50	0.021	3.4	31
3	23	49	2.13	0.021	8.9	436
5	100	169	1.69	0.021	7.7	1301
7	150	411	2.74	0.021	10.6	4,357
10	190	897	4.72	0.021	15.2	13,634
13	235	1,483	6.31	0.021	18.4	27,287



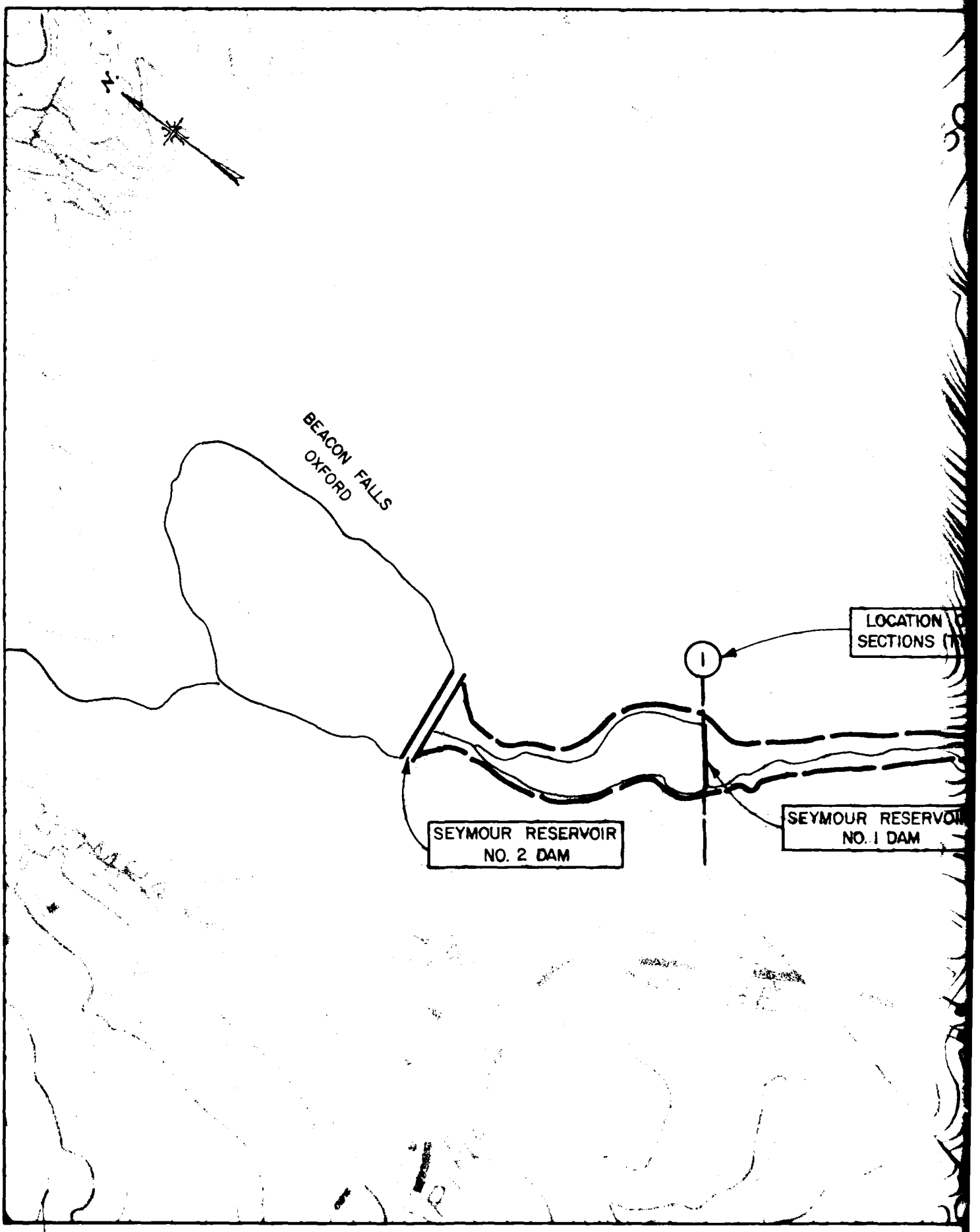
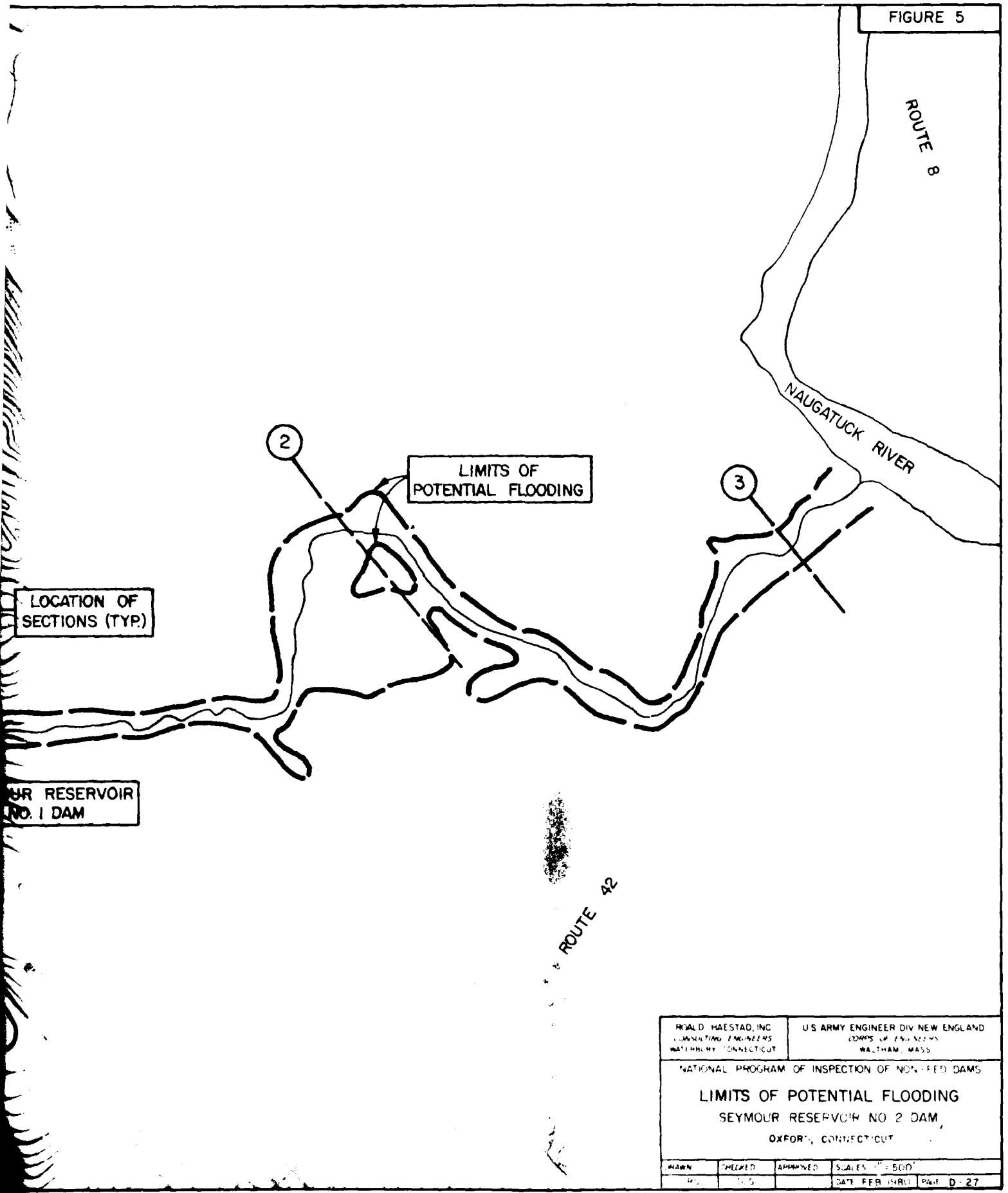

N
BEACON FALLS
OXFORD
LOCATION
SECTIONS
SEYMOUR RESERVOIR
NO. 2 DAM
SEYMOUR RESERVOI
NO. 1 DAM

FIGURE 5



RIDALD HAESTAD, INC CONSULTING ENGINEERS WATERBURY, CONNECTICUT	U.S. ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

LIMITS OF POTENTIAL FLOODING

SEYMOUR RESERVOIR NO 2 DAM,

OXFORD, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALES 1" = 500'
MS	DJS		DATE FEB 1980

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS